GT GreenbergTraurig

Mitchell F. Brecher
(202) 331-3152
BrecherM@gtlaw.com

December 5, 2011

VIA ELECTRONIC FILING

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: WC Docket No. 11-42 - Lifeline and Link Up Reform and Modernization
NOTICE OF EX PARTE PRESENTATION

Dear Ms. Dortch:

This letter is submitted on behalf of TracFone Wireless, Inc. ("TracFone"). As the Commission considers reforming the Lifeline and Link Up programs in the above-captioned docket, it is important that it focus not only on the growth of the low-income programs supported by the federal Universal Service Fund, but that it also consider the stimulative effect of those programs on the national economy, particularly on low-income consumers throughout the United States.

Numerous studies and reports have examined the economic benefits of telecommunications service in general and mobile telecommunications service in particular on economies in the U.S. and elsewhere. Several of those studies are enclosed with this letter for inclusion in the record of this proceeding.

The first study is entitled "Subsidized Cell Phones Provide Significant Economic Gains for Poor and Near-Poor Americans." It was conducted by Nicholas P. Sullivan, a Fellow at the Center for Emerging Market Enterprises at the Fletcher School of Tufts University, and was published in February 2010. Professor Sullivan has written previously about the impact of mobile phone on economic development, including a paper entitled "Cell Phones Provide Significant Economic Gains for Low-Income American Households," published by New Millennium Research in 2008. His February 2010 study is an update of the 2008 study and focuses specifically on the importance of wireless Lifeline programs -- programs which were not yet significantly available at the time of his 2008 study.

The 2010 Sullivan study concludes that the availability of Lifeline-supported mobile telephone service enables users of such services to generate additional income -- about $259 per year per user. If all adults who qualified for Lifeline support were to avail themselves of the underused Lifeline program, approximately $3.7 billion in fresh income for the poor and near poor would be produced -- an economic benefit far higher than the current cost of the Lifeline program. Of SafeLink Wireless® customers surveyed, forty-nine percent responded that their Lifeline-supported wireless phone service had improved their financial situation by helping them find work or keep work.

Although the Sullivan study focuses on SafeLink Wireless® customers, other studies have addressed other segments of the market. At p. 6 of his study, Professor Sullivan references two other studies -- one conducted on behalf of Sprint Nextel's Assurance Wireless by PKS Research Partners; the other, by the Pew Research Center. The PKS study found that eighty percent of adults with incomes below $25,000 are likely to use their mobile phones for employment searches.

In addition to the Professor Sullivan's domestic studies and those cited by him, there have been numerous studies of the impact of wireless telecommunications on economic development in emerging countries. While those countries do not have formalized low-income support programs comparable to Lifeline, these studies provide important and relevant information regarding the importance of wireless telecommunications to economic development. Included with this letter are the following:

- "The Impact of Telecoms on Economic Growth in Developing Countries," by Leonard Waverman, Meloria Meschi and Melvyn Fuss;
- "The Role of Mobile Phones in Sustainable Rural Poverty Reduction," authored by Asheeta Bhavnani, Rowena Won-Wai Chiu, Subraaniam Janakiram, and Peter Silarszky, published in June 2008 by the ICT Policy Division, Global Information and Communications Department.

TracFone respectfully requests that each of these enclosed studies be included in the record of this proceeding and that the Commission carefully and thoroughly consider the important economic benefits of mobile telecommunications on low-income populations as it makes determinations as to whether and how to reform and modernize Lifeline in a manner which advances the public interest.

Pursuant to Section 1.1206(b) of the Commission's rules, this letter is being filed electronically. If there are questions, please communicate directly with undersigned counsel for TracFone.

Sincerely,

Mitchell F. Brecher

cc: Ms. Sharon Gillett
Mr. Trent Harkrader
Ms. Kimberly Scardino
Mr. Jonathan Lechter
Ms. Jamie Susskind

Enclosures

Enclosure

(1 of 3)

Subsidized Cell Phones Provide Significant Economic Gains for Poor and Near-Poor Americans

February 10, 2011

by Nicholas P. Sullivan

Nicholas P. Sullivan is a Fellow at the Center for Emerging Market Enterprises at The Fletcher School (Tufts University), specializing in financial inclusion. He is the author of You Can Hear Me Now, How Microloans and Cell Phones Are Connecting the World's Poor to the Global Economy *(Jossey-Bass, 2007), and "Cell Phones Provide Significant Economic Gains for Low-Income American Households" (New Millennium Research, 2008).*

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Executive Summary

Lifeline Assistance is a joint federal program operated by the Federal Communications Commission (FCC) and state public utility commissions that ensures telephone service is available and affordable for low-income subscribers within 135% of the federal poverty guidelines. In 2008, recognizing the seismic national shift in phone usage away from landline and toward wireless, the FCC for the first time opened up the Lifeline Assistance program to prepaid mobile operators. The FCC's same average $10 per month discount on service now applies to wired or wireless phones. This paper focuses on the latter.

The broad question asked in this report is: *Whether or not a person who qualifies for a federal poverty program already has a cell phone, does a free cell phone loaded with varying amounts of free minutes make a quantifiable difference in that person's financial life?*

The general answer is: *Yes, for about half the population surveyed, the subsidized cell phone has been an important economic tool, which generates an average of $259 per year. If all 28.5 million adults eligible for Lifeline Assistance were to take advantage of the program and earn at the same rate and level as our sample, it would result in $3.7 billion in fresh income for the poor and near poor. In large states, such as New York, Florida, and California, the gains would exceed $250 million. By this measure, the program is already paying for itself.*

The first telecom operator to offer subsidized cell phones that were free for low-income Americans was TracFone (a subsidiary of América Móvil), through its SafeLink Wireless program, starting in August 2008. SafeLink now operates in 31 states (plus Washington, D.C., and Puerto Rico), and has distributed more than 3 million subsidized cell phones.

A new November 2010 survey of 5,541 SafeLink Wireless customers, found that:

- About half of SafeLink users (49%) said the cell phone had "improved their financial situation by helping them find or keep work." For those working or looking for work, the numbers were higher (63%); surprisingly, even the retired (39%) and disabled (38%) said the phone had helped improve their financial situation. More African Americans (57%) than white Americans (43%) said the phone had improved their financial situation.

- The average amount of money earned in the last year by SafeLink users was $259, according to the survey results. However, since a third of respondents have had their subsidized phones for less than six months, and there is a clear correlation between length of ownership and income gains, we expect that over time that average is likely to easily exceed $300 (as it already does in several states). In addition, the number of free minutes offered was initially 68, but has been increased in many states to 250; given the correlation between usage and income, this will also positively affect average earnings.
- Given the expected increase in eligible subscribers, based on the recent revamped numbers in poverty, and assuming the increased pay with increased usage and minutes, the actual potential benefits are more likely in the $5 billion range.
- An estimated 30% of the annual $1.2 billion in Lifeline spending subsidies to low-income Americans is now allocated to wireless phones. That means Lifeline's $360 million "investment" in information and communications technology (ICT) for the poor and a segment of the near poor generates a "net return" of $388 million.

The question of how subsidized phones impact the poor has recently taken on more urgency given the lingering and deep recession. The U.S. Census Bureau reports that 44 million Americans are now considered to be living in poverty (2009 data), the highest number in poverty in the 51 years this number has been tracked by the U.S. Census Bureau.[1]

In addition, an increasing number of poor Americans live in wireless-only households. Adults living in poverty (36.3%) and adults living in near poverty (29.0%) are more likely than higher-income adults (19.6%) to be living in households with only wireless telephones, according to the Centers for

[1] *Income, Poverty, and Health Insurance Coverage in the United States: 2009, Current Population Reports,* US Census, September 2010

Disease Control and Prevention (CDC) annual National Health Survey.[2] This survey and accompanying report are a follow-up to the initial "Sullivan Report" (April 2008), "Cell Phones Provide Significant Economic Gains for Low-Income American Households". Although not directly comparable, the two surveys have broad areas of agreement and consistent findings. Both indicate that the cell phone is a very powerful economic tool for poor and low-income Americans.

When the FCC initiated Lifeline for low-income Americans in 1984, the goal was twofold: 1) reduce rates for all residents in rural areas, which are more expensive to cover than urban areas; 2) reduce rates for low-income residents everywhere, as a matter of health and safety. Now, a third goal should be added: improving the financial situation of the poor.

To date, only 35 states (plus Washington, D.C., and Puerto Rico) have allowed Lifeline Assistance for cell phones, which means that the remaining 15 states are both limiting the ability of their poorest to earn money—and adding to their own state-funded liabilities for social programs. For example, our polling data shows that in the last year, New York's poorest residents added $260 million in fresh income; Pennsylvania, $182 million; and Alabama, $92 million (see Appendix A, "Potential Lifeline Subscriber Earnings by State"). At a time when states are strapped and suffering from a range of deficit liabilities, new income on this level should be a welcome outcome.

[2] *Wireless Substitution: Early Release of Estimates from the National Health Interview Survey*, July 2009-December 2009, Centers for Disease Control and Prevention, Stephen J. Blumberg, Ph.D., and Julian V. Luke (http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200912.htm)

Overview

Most of the recent studies on the impact of cell phones on poor populations have focused on the developing world, where the sales growth and penetration of cell phones have been exponential and dramatic, where landline penetration is negligible, and where the vast majority of the world's poor reside. The impact has been dramatic and measurable.

Few studies have looked at the impact of cell phones on the poor in America. One major exception was a study on economic gains for low-income Americans (the 2008 "Sullivan Report"[3]), which found that nearly a third of those working attributed an increase in income or work to their cell phone. In a survey for the study by Opinion Research Corp., (ORC) far more respondents in blue-collar jobs cited gains (40%) than white-collar professionals (27%). Respondents who reside in households making less than \$35,000—and who reported that the phone helped them make money—earned an average of \$530 a year, which translated into an aggregate economic benefit of \$4.5 billion for cell owners in that cohort. Those numbers suggested that if those without cell phones were to use them and earn at the same rate, it would add \$2.9 billion to household income.

Those promising results clearly position the cell phone as a powerful economic tool for the poor and near poor. Two other recent surveys bear this out. A nationwide survey by Assurance Wireless (a subsidiary of Sprint Nextel), conducted by PKS Research Partners, found that 80% of adults with an income of less than \$25,000 are just as likely as those with higher incomes to use their phone for employment searches. And a survey by the Pew Research Center in April and May of 2010 found that 46% of households earning less than \$30,000 are wireless Internet users (either using a laptop with Wi-Fi or a cell phone). This is a lower percentage than amongst households making \$75,000 or more, where 80% are wireless Internet users, but nonetheless indicates the depth and importance of information communications technology at all levels of society.

[3] "Cell Phones Provide Significant Economic Gains for Low-Income American Households" (New Millennium Research, 2008).

This study, based again on a survey by ORC, is a sequel to the first Sullivan Report, with a slightly different focus. This study focuses on recipients of cell phones that have been subsidized through the Federal Communications Commission's (FCC) Lifeline Assistance program, and considers the extent to which these cell phones have helped recipients make more money or find work. Because qualified recipients typically (with some minor variations by state) must be within 135% of federal guidelines for poverty[4] (or qualify for a federal program such as Medicaid, food stamps, or SSI), this study is focused exclusively on the benefits of cell-phone ownership amongst the poor and a segment of the near poor.[5]

The broad question asked is: *Whether or not a person who qualifies for a federal poverty program already has a phone, does a free cell phone loaded with varying amounts of free minutes make a quantifiable difference in that person's financial life?*

The general answer is: *Yes, for about half the population surveyed, the cell phone has been an important economic tool, which generates an average of $259 per year. If all 28.5 million adults eligible for Lifeline Assistance were to take advantage of the program and earn at the same rate and level as our sample, it would result in $3.7 billion in fresh income for the poor and near poor. In large states, such as New York, Florida, and California, the gains would exceed $250 million.*

Phone Distribution Patterns Amongst the Poor

As a matter of policy, the question of how subsidized phones impact the poor has recently taken on more urgency given the lingering and deep recession. The U.S. Census Bureau reports that the percentage of Americans living in poverty reached 14.3 percent in 2009—the highest level in 15 years.

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[4] Less than $19, 670 for a couple; less than $29,768 for a family of four

[5] The Centers for Disease Control and Prevention identifies the "near poor" as those with income between 100% and 200% of the poverty level; this study focuses on people at 135% of poverty-level income or less.

An additional 4 million Americans found themselves in poverty in 2009, bringing the total to 44 million.[6] That is the highest number in poverty in the 51 years this number has been tracked by the U.S. Census Bureau.[7]

In addition, an increasing number of poor Americans live in wireless-only households. Adults living in poverty (36.3%) and adults living in near poverty (29.0%) are more likely than higher-income adults (19.6%) to be living in households with only wireless phones, according to the Center for Disease Control and Prevention's (CDC) annual National Health Survey.[8] (Overall, 23% of all U.S. households have just cell phones; 60% had both cell and landline phones.) People residing in the South and Midwest are more likely than those in other regions to live in wireless-only homes.

While income is not the only predictor of wireless-only households—where people live, with whom they live, and age are stronger predictors than income, according to the CDC—the percentage of the poor living in wireless-only households has increased from 22% to 36% since 2006. Loss of jobs and credit leads to cut-offs of landline service, and those living on the streets or in homeless shelters have no platform for landline service (except payphones). In Washington, D.C., for example, 30% to 45% of homeless people have cell phones, according to a report in *The Washington Post*.[9] Overall, cell-phone

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[6] Under a revised formula, published in January 2011, which includes the pretax costs of health, transportation, and food, the poverty rate was revised to 15.7%, and 47.8 million people. While this revised formula does not replace the official rate as reported by the U.S. Census, it is likely to increase the number of people eligible for Lifeline Assistance in the next few years.

[7] *Income, Poverty, and Health Insurance Coverage in the United States: 2009, Current Population Reports*, US Census, September 2010

[8] *Wireless Substitution: Early Release of Estimates from the National Health Interview Survey*, July 2009–December 2009, Centers for Disease Control and Prevention, Stephen J. Blumberg, Ph.D., and Julian V. Luke (http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200912.htm)

[9] "D.C. Homeless People Use Cell Phones, Blogs and E-Mail to Stay on Top of Things," Dvorak, Petula, The Washington Post, March 23, 2009

ownership for those living below the poverty level is 73%, compared to 92% for all Americans.[10]

The percentage of adults living in "wireless-mostly" households has also been increasing, and is now at 16.3%. ("Wireless mostly" indicates households that rarely answer the landline phone, or use it almost exclusively for Internet access.) While some of the poor are in this category, adults living in poverty (10.0%) and adults living in near poverty (12.7%) were less likely than higher-income adults (19.2%) to be living in wireless-mostly households.

Federal Phone Subsidies for the Poor

The FCC has long acknowledged the importance of telephones for the poor. The FCC's Lifeline Assistance is a joint federal program (operated by the FCC and state public utility commissions) created in 1984 as a public-assistance program that ensures telephone service is available and affordable for low-income subscribers. The program, part of the Low Income Program of the Federal Universal Service Fund (USF) and administered by the Universal Service Administrative Company (USAC), was enhanced under the Telecommunications Act of 1996.

Historically, Lifeline provided discounts up to $10 per month on basic monthly service at a primary residence; the complementary Link-Up America program paid half (up to $30) of the initial installation fee for a traditional, landline telephone.

In 2008, recognizing the seismic national shift in phone usage away from landline and toward wireless, the FCC for the first time opened up the Lifeline Assistance program to prepaid mobile operators. The same $10/month discount on service now applies to post-paid wireless or prepaid wireless phones. Even if you already have a landline phone, you could qualify for a

[10] *Wireless Substitution: Early Release of Estimates from the National Health Interview Survey*, July 2009–December 2009, Centers for Disease Control and Prevention, Stephen J. Blumberg, Ph.D., and Julian V. Luke

Lifeline wireless phone (in most states) if you are within 135% of federal poverty guidelines. That equates to a maximum of $14,621 for a single-person household to a maximum of $49,964 for a family of eight (for each additional person, add $5,049). A recipient may not apply Lifeline to both landline and wireless phones.

The program was started during the Reagan administration. Lifeline, while administered as a federal program, is supported by the USF, which was created by the FCC in 1997 to meet Congressional universal service goals as mandated by the Telecommunications Act of 1996. The Act states that all providers of telecommunications services should contribute to federal universal service in some equitable and nondiscriminatory manner; there should be specific, predictable, and sufficient federal and state mechanisms to preserve and advance universal service; all schools, classrooms, health care providers, and libraries should, generally, have access to advanced telecommunications services; and finally, that the Federal-State Joint Board and the FCC should determine those other principles that, consistent with the 1996 Act, are necessary to protect the public interest.

As of the first quarter of 2010, the USF fee equaled 14.1% of a telecom company's interstate and end-user revenues. The vast proportion of all Lifeline funds—$4.6 billion in 2010—is directed to lower the cost of rural telephone service for people of all income levels; essentially, higher urban rates subsidize lower rural rates. Total phone subsidies for low-income families totaled $1.2 billion in 2010; the percentage of people using Lifeline for cell phones rather than landline service was 30% in 2010.

Lifeline and Prepaid Cell Phones

The first prepaid telecom operator to offer subsidized cell phones to the poor for free was TracFone (a subsidiary of América Móvil), through its SafeLink Wireless program, starting in Tennessee in August 2008. SafeLink now operates in 31 states (plus Washington, D.C., and Puerto Rico), and has distributed more than 3 million cell phones. Of the 1,700 companies that offer phone discounts, SafeLink Wireless is second only to AT&T in the number of Lifeline subscribers[11] and has the most Lifeline subscribers in 10 states.

SafeLink Wireless applies the USF subsidy to an allotment of free airtime plans. SafeLink offers up to 250 free minutes per month (up from 68 minutes through June 2010), to use for voice or texting. Safelink also offers a 125-minute plan with the ability to roll over minutes from month to month, and a 68-minute plan that offers international calling to more than 100 locations. Additional minutes can be purchased for 10 to 20 cents, depending on state. In all cases, recipients may keep the SafeLink-provided handset even if they don't qualify for Lifeline the following year. The cell phone offers voicemail, text, three-way calling, call waiting, caller ID, and access to 911 (even if all free minutes have been used).

Sprint Nextel's Assurance Wireless (offered through Virgin Mobile) now operates in 21 states. Assurance Wireless offers 250 free minutes each month (up from 200 minutes through October 2010), with no allowance for texting or international calls. Assurance Wireless also offers customers the ability to increase monthly minutes to 500 for $5, or 1,000 minutes and 1,000 text messages for $20.

Methodology

The ORC survey of 5,541 SafeLink Wireless users[12] in 22 states plus Washington, D.C.,[13] was conducted by landline phone between October 25 and November 22, 2010. Respondents were at least 18 years old living in private households in the continental United States. Landline calls were made, rather than cell phone calls, so that those surveyed would not lose valuable minutes on their phones. SafeLink Wireless provided funding for the ORC survey and report.

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[11] SafeLink Wireless website

[12] 12% said they also had a monthly contract phone, and 8% said they had another prepaid phone.

[13] Alabama, Connecticut, Washington, D.C., Delaware, Florida, Georgia, Illinois, Louisiana, Massachusetts, Maryland, Maine, Michigan, Missouri, North Carolina, New Hampshire, New Jersey, New York, Ohio, Pennsylvania Tennessee, Virginia, Wisconsin, West Virginia. Interviews were conducted with roughly 225 people in each of the 22 states, and 93 in D.C.

The breakout was 45% male (2,501) and 55% female (3,040). Of the total, 8% (421) said they were working full-time, 10% (574) were self-described as working part-time, 27% (1,483) were unemployed, 32% (1,781) were disabled, and 23% (1,254) were retired. The small number actually working full-time (8%) and the large number unemployed (27%) or looking for work (16%) could account for the reason income levels are so low in this cohort. Those working full- or part-time were far more likely to be younger, and to have children in the household.

Of those not working, whether due to unemployment, disability, or retirement, 890 were actively looking for work. That yields a total of 995 people working, and 890 looking for work, a total of 1,985 in the "work force". This is a statistically valid sample of the working population to project numbers to the larger population at a 95% confidence level.

In terms of education, 7% had an 8th grade education or less, 22% had not completed high school, 43% were high school graduates, 20% had some college, 5% were college graduates, and 1% had an advanced degree. In terms of race, 50% were white/Caucasian, 40% black/African American, 11% "other" or "unidentified" and 1% Asian/Asian American. In terms of age, 14% were in the 18- to 34-year-old age bracket, 26% in the 35 to49 bracket, 35% in 50 to 64 bracket, and 24% were 65 and older.

The relatively small cohort of 18- to 34-year-old respondents (14%) may skew some of the employment numbers lower, as this age bracket has the highest incidence of both full-time (18%) and part-time (24%) workers of any age group. The 18- to 34-year-old segment also showed the highest level of unemployment (46%). The incidence of workers and non-workers by race, on the other hand, is very evenly distributed.

Detailed Findings

The subsidized cell phone is clearly an important economic tool for the poor and near poor. Virtually half (49%) said the phone had helped them to find or keep work, and attribute income gains to the phone. This is true for those working and those looking for work. And while larger numbers of young people (67% of the 18- to 34-year-old segment), females (52%), and African Americans (57%) attributed improved finances to the phone, a significant percentage of all groups cite very positive gains.

For many respondents (42%), the subsidized SafeLink phone is the first cell phone they have owned, particularly for the older and less-educated cohorts. Having used a SafeLink phone, a third for less than six months, 57% say if they didn't have a SafeLink phone they would be most likely to get a cell phone, with the vast majority opting for a prepaid phone. However, a fifth of all SafeLink subscribers already had either a postpaid or prepaid cell phone, and 41% of those employed full-time have a cell phone in addition to their SafeLink phone, and 71% also have a landline phone.

To be sure, the landline phone is still the phone of choice for these households—58% use a landline phone "most often" to receive calls, and a similar number (55%) to make calls. But, because the cell phone is so new to so many, that pattern is likely to change. Already, 19% said they had purchased extra minutes when their allotment of free minutes (60–250, depending on the state) ran out. Even more, roughly a quarter, of those working or looking for work added more minutes. For people living close to the edge, and dependent on federal subsidies for many aspects of daily life, the impetus to buy more minutes is a strong indication of the perceived and/or real value of the phone in generating income.

Work-related Calls

While "calling family" was cited as the most important benefit of the cell phone (46%), "finding a job" and "staying in touch with your job or employer" was the second most-cited benefit (11%). More strikingly, 49% of the total universe said the cell phone had "improved their financial situation by helping them find or keep work." For those working or looking for work, the numbers whose financial situation had improved were higher.
In the total universe, nearly a quarter (22%) say more than 25% of their cell-phone calls are related to work or money—and for a minority (10%) more than 50% of all calls are work-related. The average percentage of work-related calls was highest amongst part-time workers (38%), which may indicate they are looking for other work to supplement their part-time position. For full-time workers (34%), those looking for work (32%), and 18- to 34-year-olds (31%), roughly one-third of all calls are work-related.

One notable difference from previous studies on prepaid cell phones is the propensity to use advanced phone features. For example, 44% use voicemail; 39% send or receive text messages; 34% use call waiting; and 60% use caller ID. The big surprise is the number who use voicemail, which cuts into minutes, and which other groups have cited as a reason to ignore missed calls. This may reflect a growing sophistication, but more likely suggests a sense of urgency in tracking possible work offers.

Income Gains at Micro Level

How does this usage translate to income gains? Of those who said the phone had improved their financial situation by helping them find or keep work (49%), all but 19% ("don't know") cited some phone-related income in the last year, although a third said that income was less than $100. So, for roughly half of those whose financial situation improved, the gains were non-existent or minimal. It is important to note that the SafeLink program is relatively young, having started in August 2008, and that some states have only been approved in the last year. A third (33%) of respondents have had their SafeLink phone less than six months, 29% for between six months and year, and only 36% for more than a year (2% "don't know").

For the other half of respondents whose financial situation improved, 38% cited income gains between $100 and $500, with about twice the number making less than $250 as more than $250. And 11% cited gains of more than $500, with about 4% of these saying they had made more than $1,000 (the highest value interviewers cited).

In the under $100 category, significant numbers of the retired (38%), unemployed (37%), and disabled (29%) said the phone had helped them earn money in the last year. These earnings could come from spot jobs, and perhaps an attribution of value to the subsidized phone; interviewers did not tease out the source of income for any group.

Factoring in all responses, the average income gained in the last year was $259. Those working full-time cited average income gains of $303, but even those unemployed ($246) or looking for work ($257) were only marginally below the mean.

Income Gains at Macro Level

Using ORC's statistically sturdy survey (at 95% confidence level) as a base, we can extrapolate out to the population at large the impact of using a cell phone to generate income. If all Americans eligible for Lifeline Assistance (28.5 million in 2009) were to earn money with their cell phones at the same rate as those in our sample, that would equate to income gains of $3.7 billion for the poor and a large segment of the near poor.[14]

However, these numbers are likely understated, because so many actual Lifeline Assistance cell phone subscribers have had their phones for less than six months, thus have yet to see the full economic impact. For example, in Louisiana, where 71% of those surveyed said they had had their phones for less than six months, the average earnings were $197; in Maine, 79% had had the phone less than six months, and average earnings were $223; in Missouri (62%), average earnings were $175 (see Appendix: "Potential Lifeline Subscriber Earnings by State").

By contrast, the bigger earners came from states that have offered the program longer. In Wisconsin, only 31% had had their phones less than six months, and earnings averaged $312; in Pennsylvania (20%), earnings averaged $303; and in Delaware (21%), $306. (see chart, State by State Results).

The longer people have the phone the more money they attribute to it. In addition, the more minutes they have to use, the more money they earn. Given that SafeLink has slowly been increasing free minutes from 68 to 250 minutes in several states, that trend will impact earnings.

[14] 28.5 eligible adults, divided by 2 (roughly half say the phone makes them money) equals 14.25 million. Multiply by $259 to get $3.7 billion.

Given the expected increase in eligible subscribers, based on the recent revamped numbers in poverty, and assuming the increased pay with increased usage and minutes, the actual potential benefits are more likely in the $5 billion range.

While this current study differs in some regards from the initial Sullivan Report (2008), both share a focus on poor and near poor Americans—in the first study, the bottom two quintiles (less than $35,000 per household); in this study, those at or below 135% of the federal poverty level.

Comparison to Previous Study

There are several major differences between this current study and the Sullivan Report. In the first study, a statistical slice of the whole population was surveyed, although we focused on the lower-income segments. Second, the first survey covered all states, compared to 22 in this survey. Third, the first survey included all cell phones (postpaid and prepaid) that subscribers had bought with their own money, while this study covers only prepaid phones that have been provided by the USAC's Lifeline service. Finally, the first survey covered households; while this current survey has some household questions, it aimed more at individual phone users. Thus, the studies are not directly comparable.

Nonetheless, the two studies have general and broad areas of agreement. For example, in the first survey, of all Americans, 31% of those working said the cell phone helped them make money, while in the second survey of poor and near-poor Americans, far more said the phone helped them make money—49%. But 43% of prepaid users in the first study said the phone helped them make money (compared to 28% of postpaid). Taken together, the two studies indicate that the phone is a more powerful economic tool for those with lower incomes, who are more likely to use a prepaid than postpaid phone.

In the first study, the average income gain attributed to cell phones for those in the bottom two quintiles (less than $35,000 annual income) was $530, implying aggregate income gains of $4.5 billion. (The Lifeline cutoff for a family of 5 is $34,816, so many potential Lifeline subscribers fall within these two quintiles.) If the 38% of 45.2 million bottom-quintile households that did not then have cell phones were to start using them, and earn money at the same rate as those households that did own cell phones, it would add $2.9 billion to household incomes.

In this current study, the average income was $259 from the SafeLink phone, which projects out to income gains of $3.7 billion for all adults eligible for Lifeline Assistance.

While these numbers are different, they are relatively consistent. In the three years since the first survey, the percentage of low-income Americans with cell phones has increased dramatically, which means the potential income gains from adding new phones are smaller in the aggregate. In the first study, all respondents had bought their own phone, postpaid or prepaid, as Lifeline did not apply to cell phones at that time; thus, the demographic profile was more upscale than in the current survey. For example, in the first survey, 50% said the phone had helped them earn more than $500, versus 11% in this study. Finally, in the current study, the majority of respondents have had their SafeLink phones for less than one year, and many for less than six months.

Conclusion

This survey of 5,541 SafeLink subscribers to phones subsidized by the USF, especially when bumped against the previous (2008) survey of cell phone usage amongst lower-income Americans, indicates that the cell phone is a very important economic tool for poor Americans. Even though "staying in touch with family" was cited as the most important aspect of the cell phone by an overwhelming margin, roughly half (49%) said the phone had helped them find or keep work and make money. That response, given that more than half of those surveyed were either retired (23%) or disabled (32%), is very impressive. So is the number of work-related calls, with nearly a quarter (22%) making more than 25% of all calls on work or money issues.

For those who said they did make money, the average gain was $259. This is clearly a relatively modest gain even for someone living in poverty, and if it resulted from a phone bought at retail might not even cover the costs of using the phone. But, at a time when the country has more people living below the federal poverty limit than ever before, and when people in poverty are much more likely than the population at large to live in wireless-only households, the positive impact of a cell phone cannot be overstated, especially when aggregated to project potential gains for the entire population.

Consider also that in many states the number of free minutes is capped at 60, and since we can assume a correlation between the amount of minutes used and money earned (from the first Sullivan Report), the income impact might be higher with more minutes over a longer time period. The benefits can be expected to accelerate as the program matures and people own their phones for longer periods.

The survey did not ask for a comparison between landline and cell phone, but it seems that respondents rate them equally. When asked if they didn't have a SafeLink phone what type of phone they would get, 57% said a cell phone (with nearly three out of four saying a prepaid phone), and 59% said a landline phone. Considering that 42% had never owned a cell phone before, this is a sound endorsement of mobile versus fixed-line phone technology. In the slightly more than two years since the Lifeline program was extended to cell phones (as well as landline), the number of Lifeline cell phone customers has risen from 0% to 30%. That increase is doubly impressive considering that the dominant provider, SafeLink Wireless, operates in just 31 states (plus Washington, D.C., and Puerto Rico).

Consider that 30% of the annual $1.2 billion in Lifeline spending is now allocated to wireless phones; that $360 million "investment" in information and communications technology (ICT) for the poor and a segment of the near poor generates a "return" of $388 million.[15] Lifeline's $240 million

[15] $360 million divided by $120 (the subsidy per customer per year) equals 3 million. Divide by 2 (roughly half say the phone helps them make money) to get 1.5. Multiply by $259 to get $388 million.

"investment" in SafeLink Wireless's 2 million customers generates a $259 million return.[16] While that return is not large, it does demonstrate that the USF subsidy is productive.

These positive indicators have implications for policy makers. When the FCC initiated Lifeline for low-income Americans in 1986, the goal was twofold: 1) reduce rates for all residents in rural areas, which are more expensive to cover than urban areas; 2) reduce rates for low-income residents everywhere, as a matter of health and safety.

Now, a third goal should be added: improving the financial situation of the poor. The landline phone was never perceived as an economic tool in a residential setting, although of course it was and is in a commercial setting. The cell phone, however, is not just a phone, but a mini computer that is always at hand, which allows its owners mobility and access to information. In an age driven by information communications technology, that access is an economic necessity—one borne out by the results of this study.

To date, 35 states (plus Washington, D.C., and Puerto Rico) have allowed Lifeline Assistance for cell phones, which means that the remaining 15 states are both limiting the ability of their poorest to earn money—and adding to their own state-funded liabilities for social programs. For example, our polling data shows that in the last year, New York's poorest residents added $260 million in fresh income, Pennsylvania added $182 million, and Alabama, $92 million. At a time when states are strapped and suffering from a range of deficit liabilities, new income on this level should be a welcome outcome.

[16] 2 million customers multiplied by $120/yr equals a $240 million investment. To calculate the return, divide 2 million by 2 to get 1, and multiply by $259 to get $259 million.

Appendix: Potential Lifeline Subscriber Earnings by State

How to Read This Chart:

The states in regular Roman font are states in which Opinion Research Corporation polling was conducted. The percentage of respondents who said the phone had helped them make money, and the average income earned, are taken from polling data. Given the number of eligible Lifeline Assistance subscribers in each state, we calculate the total potential income in that state, if each potential subscriber were to take advantage of a subsidized cell phone.

The states listed in ALL CAPITAL LETTERS are states in which SafeLink Wireless operates, but were not part of the survey. Using average figures for respondents who said the phone helped them earn money (49%) and average income ($259), we estimate the total potential income in those states, were each potential subscriber to take advantage of the subsidized phone.

The states listed in ***Bold Italics*** are states that do not yet allow prepaid wireless cell phone operators to take advantage of Lifeline Assistance. Again, using average numbers from the survey data, we project potential earnings in those states.

For states in which polling was conducted, we show the percentage of respondents who had had their subsidized phones for less than six months. Comparing this figure to the average income shows a correlation between length of ownership and potential income. For states in which actual polling was not conducted, we list average figures for ownership less than six months (33%) and potential income ($259).

State	# Eligible for Lifeline 2009	% Who Make $$ with Cell Phone	% Who Had Phone < 6 Mos	Mean Income from Cell Phone ($)	Total Potential Income ($)
Alabama	649,105	52	33	273	92,146,946
Alaska	33,050	49		259	4,194,376
Arizona	531,600	49		259	67,465,356
ARKANSAS	407,838	49	33	259	51,758,721
California	2,424,002	49		259	307,630,094
Colorado	315,825	49		259	40,081,351
Connecticut	219,700	50	23	256	28,121,600
Delaware	70,399	51	21	306	10,986,468
District of Columbia	68,711	38	30	335	8,746,910
Florida	1,953,211	52	16	268	272,199,485
Georgia	802,193	55	17	255	112,507,568
Hawaii	73,511	49		259	9,329,281
Idaho	143,226	49		250	17,545,185
Illinois	1,052,937	59	50	211	131,080,127
INDIANA	632,767	49		259	80,304,460
IOWA	322,216	49		259	40,892,433
KANSAS	258,379	49		259	32,790,879
KENTUCKY	595,290	49		259	75,548,254
Louisiana	616,194	54	71	197	65,550,718
Maine	150,993	37	79	223	12,458,432
Maryland	334,607	49	31	276	45,252,251
Massachusetts	481,678	44	16	241	51,077,135
Michigan	905,734	47	12	292	124,302,934
MINNESOTA	424,380	49		259	53,858,066
MISSISSIPPI	421,994	49	33	259	53,555,259
Missouri	658,411	48	62	175	55,306,524
Montana	103,447	49		259	13,128,459
Nebraska	169,817	49		259	21,551,475
NEVADA	190,170	49	33	259	24,134,475
New Hampshire	79,438	43	33	232	7,924,735
New Jersey	519,311	47	27	269	65,656,490
New Mexico	217,361	49		259	27,585,285
New York	1,717,516	55	13	276	260,718,929
North Carolina	996,978	53	19	239	126,287,203
North Dakota	81,934	49		259	10,398,244
Ohio	1,226,064	52	24	321	204,654,603
Oklahoma	478,704	49		259	60,752,325
Oregon	326,141	49		259	41,390,554
Pennsylvania	1,335,025	45	20	303	182,030,659
PUERTO RICO	812,001	49	33	259	103,051,047
RHODE ISLAND	102,567	49	33	259	13,016,778
SOUTH CAROLINA	494,228	49	33	259	62,722,475
South Dakota	91,423	49		259	11,602,493
Tennessee	713,713	48	15	270	92,497,205
TEXAS	2,277,836	49	33	259	289,080,167
UTAH	131,458				
Vermont	58,984	49		259	7,485,659
Virginia	576,607	49	26	252	71,199,432
WASHINGTON	490,581	49	33	259	62,259,635
West Virginia	279,008	51	33	287	40,838,401
Wisconsin	454,084	45	31	312	63,753,394
Wyoming	57,206	49		259	7,260,013
TOTAL	**28,529,553**				**3,715,670,945**

Enclosure

(2 of 3)

The Impact of Telecoms on Economic Growth in Developing Countries

Leonard Waverman, Meloria Meschi and Melvyn Fuss[1]

Summary

There is a long tradition of economic research on the impact of infrastructure investments and social overhead capital on economic growth. Studies have successfully measured the *growth dividend* of investment in telecommunications infrastructure in developed economies.[2] But few have assessed the impact of telecommunications rollout in developing countries. Given the importance of telecommunications to participation in the modern world economy, we seek to fill the void in existing research.

Investment in telecoms generates a growth dividend because the spread of telecommunications reduces costs of interaction, expands market boundaries, and enormously expands information flows. Modern revolutions in management such as 'just-in-time' production rely completely on efficient ubiquitous communications networks. These networks are recent developments. The work by Roeller and Waverman (2001) suggests that in the OECD, the spread of modern fixed-line telecoms networks alone was responsible for one third of output growth between 1970 and 1990.

Developing countries, however, experience a *low telecoms trap* – the lack of networks and access in many villages increases costs, and reduces opportunities because information is difficult to gather. In turn, the resulting low incomes restrict the ability to pay for infrastructure rollout.

In the OECD economies, modern fixed-line networks took a long time to develop. Access to homes and firms requires physical lines to be built – a slow and expensive process. France, which had 8 fixed line telephones per 100 population (the 'penetration rate') in 1970, doubled this by 1976, and reached 30 main lines per 100 population in 1980. Mobile phones are lower cost and far quicker to rollout than fixed lines. In 1995, Morocco had 4 fixed lines per 100 inhabitants after many years of slow investment, and zero mobile phones per 100 inhabitants. In 2003, only eight years later, the mobile phone penetration rate in Morocco was 24, while fixed line penetration had stagnated at its 1995 level.

We find that mobile phones in less developed economies are playing the same crucial role that fixed telephony played in the richer economies in the 1970s and 1980s. Mobile phones substitute for fixed lines in poor countries, but

1 London Business School and LECG; John Cabot University and LECG; University of Toronto and LECG. Funding for this research was provided by Vodafone and the Leverhulme Trust. We thank Kalyan Dasgupta for sterling assistance. We are indebted to Mark Schankerman for suggesting the use of an endogenous growth approach.

2 These studies include Hardy (1980), Norton (1992), and Roeller and Waverman (2001). Full bibliographical details are given in footnotes 8, 9 and 3 respectively.

complement fixed lines in rich countries, implying that they have a stronger growth impact in poor countries. Many countries with under-developed fixed-line networks have achieved rapid mobile telephony growth with much less investment than fixed-line networks would have needed.

We subjected the impact of telecoms rollout on economic growth in poorer nations to a thorough empirical scrutiny. We employed two different approaches– the Annual Production Function (APF) approach following the work of Roeller and Waverman (2001) and the Endogenous Technical Change (ETC) approach similar to the work of Robert Barro (1991). The latter provided us with the most robust and sensible estimates of the impact of mobile telephony on economic growth. We used data on 92 countries, high income and low income, from 1980 to 2003, and tested whether the introduction and rollout of mobile phone networks added to growth.

We find that mobile telephony has a positive and significant impact on economic growth, *and this impact may be twice as large in developing countries compared to developed countries*. This result concurs with intuition. Developed economies by and large had fully articulated fixed-line networks in 1996. Even so, the addition of mobile networks had significant value-added in the developed world: the value-added of mobility and the inclusion of disenfranchised consumers through pay-as-you-go plans unavailable for fixed lines. In developing countries, we find that the growth dividend is far larger because here mobile phones provide, by and large, the main communications networks; hence they supplant the information-gathering role of fixed-line systems.

The growth dividend of increasing mobile phone penetration in developing countries is therefore substantial. All else equal, the Philippines (a penetration rate of 27 percent in 2003) might enjoy annual average per capita income growth of as much as 1 percent higher than Indonesia (a penetration rate of 8.7 percent in 2003) owing *solely* to the greater diffusion of mobile telephones, were this gap in mobile penetration to be sustained for some time.

A developing country that had an average of 10 more mobile phones per 100 population between 1996 and 2003 would have enjoyed per capita GDP growth that was 0.59 percent higher than an otherwise identical country.

For high-income countries, mobile telephones also provide a significant growth dividend during the same time period. Sweden, for example, had an average mobile penetration rate of 64 per 100 inhabitants during the 1996 to 2003 period, the highest penetration of mobiles observed. In that same period, Canada had a 26 per 100 average mobile penetration rate. All else equal, we estimate that Canada would have enjoyed an average GDP per capita growth rate nearly 1 percent higher than it actually was, had the mobile penetration rate in Canada been more-than-doubled.

Our research also provides new estimates of demand elasticities in developing countries – we find both the own–price and income elasticities of mobile phone demand to be significantly above 1. That is, demand increases much more than in proportion to either increases in income or reductions in price. We also find that mobile phones are substitutes for fixed-line phones.

Introduction

Economists have long examined the importance of social overhead capital (SOC) to economic growth. SOC is generally considered as expenditures on education, health services, and public infrastructure: roads, ports, and the like. Telecommunication infrastructure, whether publicly or privately funded, is a crucial element of SOC. We in the west tend to forget what everyday life would be like, absent modern telecommunications systems. These networks enable the ubiquitous, speedy spread of information. Alan Greenspan, the Chairman of the US Federal Reserve Board, coined the term "New Economy" to represent how the spread of modern information and communications technology has enabled high growth with low inflation. This "New Economy" is the direct result of the networked computer – the ability of higher bandwidth communications systems to allow computer-to-computer communications.[3] The "New Economy" enables greater competition and new means of organising production.

In earlier periods, telecommunications networks helped generate economic growth by enabling firms and individuals to decrease transaction costs, and firms to widen their markets; Roeller and Waverman (2001)[4] estimated the impact on GDP of investment in telecoms infrastructure in the OECD between 1970 and 1990. They showed it significantly enhanced economy-wide output, allowing for the fact that the demand for telecoms is itself positively related to GDP. One must remember that in 1970 telecoms penetration was quite low in a number of OECD countries. While the US and Canada had near-universal service in 1970, in the same year France, Portugal and Italy for example, had only 8, 6, and 12 phones per 100 inhabitants respectively. It is then not surprising that the spread of modern telecommunications infrastructure between 1970 and 1990 generated economic growth over and above the investment in the telecoms networks itself.

Roeller and Waverman also demonstrated that the scale of impact of the increased penetration of telecoms networks on growth depended on the initial level of

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[3] The "Networked Computer" is the focus of a major research programme at London Business School funded by the Leverhulme Trust.

[4] Roeller, Lars-Hendrik and Waverman, Leonard. "Telecommunications Infrastructure and Economic Development: A Simultaneous Approach." *American Economic Review*, 2001, *91*(4), pp.909-23.

penetration, with the biggest impact occurring near universal service – a phone in every household and firm. The standard government policy of universal service was, then, not only a question of equity, but was also implicit recognition of the growth-enhancing properties of telephony expansion.

In 1995, just under half of the membership of the International Telecommunications Union (ITU), an international organisation comprising 214 countries, had telecoms penetration rates below 8, the level attained by France in 1970. Much of the world still lacked a major component – the telephone – of a modern, efficient economic system in 1995.

In the 1970 to 1990 period analysed by Roeller and Waverman mobile phones were not important: telecoms networks were fixed-line systems. Today, when we consider telephone networks, the importance of mobiles stands out, especially when we examine the 102 members of the ITU that had low phone penetration in 1995.

Table 1 lists these countries (*i.e.,* with less than 8 phones per 100 population in 1995, when virtually all phones were fixed lines) and the penetration rate in 2003 for both fixed lines and mobiles. The average fixed-line penetration rate of these 102 countries in 1995 was 2.5 phones per 100 population, and this level was achieved after decades of investment. With the subsequent rapid growth of mobile phones in many, but not all, of these countries, the average penetration rate of mobile phones alone rose to 8 per cent in 2003. In 22 of the 102 countries, mobile penetration reached double digits in 2003. And in 7 countries, over one-quarter of the population had mobile phones in 2003 - Albania, Bosnia, Botswana, the Dominican Republic, Paraguay, the Philippines and Thailand.

The story is clear. In developing countries, modern telecoms systems are largely mobile systems and not fixed lines. The reason is the lower cost and faster rollout of mobile systems as compared to fixed lines. It has been estimated that a mobile network costs 50 percent less per connection than fixed lines and can be rolled out appreciably faster. The cost advantages of mobile phones as a development tool consist not only of the lower costs per subscriber but also the smaller scale economies and greater modularity of mobile systems. Morocco is a good example of the spread and impact of cell phones. In 1995, the Moroccan telecoms penetration rate was 4 fixed lines per 100 people and zero mobile phones per 100 people. Only eight years later, mobile penetration alone in Morocco was 24 per 100 people, while fixed-line penetration stayed essentially the same.

Table 1: The Emergence of Mobile Telephony in 102 Low and Middle-Income Nations

Country	Main lines per 100 population in 1995	Main lines per 100 population in 2003	Mobile Subscribers per 100 population in 1995	Mobile Subscribers per 100 population in 2003
Afghanistan	0	0	0	1
Albania	1	8	0	36
Algeria	4	7	0	5
Angola	0	1	0	..
Bangladesh	0	1	0	1
Benin	1	1	0	3
Bhutan	1	3	0	1
Bolivia	3	7	0	15
Bosnia and Herzegovina	6	24	0	27
Botswana	4	7	0	30
Burkina Faso	0	1	0	2
Burundi	0	0	0	1
Cambodia	0	0	0	4
Cameroon	0	..	0	7
Cape Verde	6	16	0	12
Central African Rep.	0	..	0	1
Chad	0	..	0	1
China	3	21	0	21
Comoros	1	2	0	0
Congo	1	0	0	9
Congo (Democratic Republic of the)	0	..	0	2
Cote d'Ivoire	1	1	0	8
Cuba	3	..	0	..
Dem. People's Rep. of Korea	2	4	0	..
Djibouti	1	2	0	3
Dominican Rep.	7	12	1	27
Ecuador	6	12	0	19
Egypt	5	13	0	8
El Salvador	5	12	0	18
Equatorial Guinea	1	2	0	8
Eritrea	0	1	0	0
Ethiopia	0	1	0	0
Gabon	3	3	0	22
Gambia	2	..	0	..
Ghana	0	1	0	4
Guatemala	3	..	0	..
Guinea	0	0	0	1
Guinea-Bissau	1	1	0	0
Guyana	5	..	0	..
Haiti	1	2	0	4
Honduras	3	..	0	..
India	1	5	0	2
Indonesia	2	4	0	9
Iraq	3	..	0	..
Jordan	7	11	0	24
Kenya	1	1	0	5
Kiribati	3	..	0	1

Country	Main lines per 100 population in 1995	Main lines per 100 population in 2003	Mobile Subscribers per 100 population in 1995	Mobile Subscribers per 100 population in 2003
Kyrgyzstan	8	..	0	..
Lao P.D.R.	0	1	0	2
Lesotho	1	..	0	..
Liberia	0	..	0	..
Libya	6	14	0	2
Madagascar	0	0	0	2
Malawi	0	1	0	1
Maldives	6	..	0	..
Mali	0	..	0	2
Marshall Islands	7	8	1	1
Mauritania	0	1	0	13
Mayotte	4	..	0	22
Micronesia (Fed. States of)	7	10	0	5
Mongolia	4	6	0	13
Morocco	4	4	0	24
Mozambique	0	..	0	2
Myanmar	0	1	0	0
Namibia	5	7	0	12
Nepal	0	2	0	0
Nicaragua	2	4	0	9
Niger	0	..	0	0
Nigeria	0	1	0	3
Oman	8	..	0	..
Pakistan	2	3	0	2
Palestine	3	9	1	13
Papua New Guinea	1	..	0	..
Paraguay	3	5	0	30
Peru	5	7	0	11
Philippines	2	4	1	27
Rwanda	0	..	0	2
Samoa	5	7	0	6
Sao Tome and Principe	2	5	0	3
Senegal	1	2	0	6
Sierra Leone	0	..	0	..
Solomon Islands	2	1	0	0
Somalia	0	..	0	..
Sri Lanka	1	5	0	7
Sudan	0	3	0	2
Swaziland	2	4	0	8
Syria	7	..	0	..
Tajikistan	4	4	0	1
Tanzania	0	0	0	3
Thailand	6	10	2	39
Togo	1	1	0	4
Tonga	7	..	0	..
Tunisia	6	12	0	19
Turkmenistan	7	..	0	..
Tuvalu	5	..	0	0
Uganda	0	0	0	3
Uzbekistan	7	7	0	1

Country	Main lines per 100 population in 1995	Main lines per 100 population in 2003	Mobile Subscribers per 100 population in 1995	Mobile Subscribers per 100 population in 2003
Vanuatu	3	3	0	4
Viet Nam	1	5	0	3
Yemen	1	..	0	3
Zambia	1	1	0	2
Zimbabwe	1	3	0	3

Average Fixed Penetration in 1995: 2
Average Fixed Penetration in 2003: 5

Average Mobile Penetration in 1995: 0
Average Mobile Penetration in 2003: 8

The Importance of Conveying Information

Consider what communicating in France must have been like 35 years ago, in 1970, with only 8 phones per 100 people. The description of Geertz (1978) as applying to developing countries, “information is poor, scarce, maldistributed, inefficiently communicated and intensely valued”[5], must have applied equally to France. Residents of remote villages with no phone connections would have enormous difficulty in discovering prices of commodities. Farmers would not have access to alternative sources of fertilisers or access to alternative buyers of their products. As recent studies on the use of mobile phones in South Africa show, the substitute for telecommunicated information would have been physical transport.[6] Instead of a quick phone call, never mind Internet usage, determining selling or buying prices would require costly, time-consuming physical contacts and transport. Thus without telecommunications, the costs of information retrieval and of transacting in general would be high. Besides greater transaction costs, the range of supply would be much smaller, or for transactions across large distances, risks would be higher as prices and conditions of sale would not be known exactly. Modern telecom networks, then, are crucial forms of Social Overhead Capital. But how important are they?

There are two basic ways in which economists determine the extent of the economic growth impact of some factor such as increased education or telecoms infrastructure investment – aggregate production function (APF) estimation and the endogenous technical change (ETC) approach.

In the first approach – the APF – the level of economy-wide Gross Domestic Product (GDP) each year is assumed to be determined by that year’s aggregate capital, aggregate labour, and other specific factors such as education or the spread of telecommunications. The growth dividend of telecoms would be measured by its annual contribution to GDP growth. The second approach – the ETC – relates the average rate of growth of GDP over a substantial period (we use the 24-year period 1980 to 2003) to the initial level of GDP, average investment as a share of GDP during that period, the initial stock of labour represented in terms of its educational

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[5] Geertz, Clifford. “The Bazaar Economy: Information and Search in Peasant Marketing.” *American Economic Review*, 1978, *68*(2), pp.28-32.

attainment[7], and the initial or average telephone penetration rate. The contribution of telecoms to growth is here measured by its boost to the long-term growth rate. The ETC approach is *not* an average over time of the APF approach, as the two models rest on different theoretical underpinnings.

Empirically, the two methods differ as well: the production function approach uses annual data, so errors or missing observations cause significant difficulties. The endogenous technical change approach uses period averages and initial period values instead, and it is thus less prone to data errors. Given the paucity of reliable data in developing countries, the ETC approach should prove more robust and tractable.

Because demand for telecoms services rises with wealth, it is crucial in the APF approach to disentangle two effects – the impact of increased telecoms rollout on economic growth and the impact of rising GDP itself on the demand for telecoms. This is called the two-way causality issue, or 'endogeneity', as the demand for telecoms is itself dependent on the level of GDP. Hence estimating an APF alone would lead to biased and likely exaggerated measures of the growth dividend of telecoms.

This endogeneity problem is handled in Roeller-Waverman by developing a four-equation model: the first equation is the output equation or economy-wide production function; the second equation determines the demand for telecoms; a third equation determines the investment in telecoms infrastructure and a final equation relates investment to increased rollout. In this model, the explicit causality from GDP to demand is recognised in equation two, allowing any estimated effect of telecoms on growth (equation one) to be net of the demand-inducing effects of rising GDP.

The two-way causality problem cannot be dealt with explicitly in the endogenous growth model approach but is unlikely to be a central issue. One cannot, for example, add a demand equation defined as the average demand over the

[6] See (for example) World Resources Institute. *Digital Dividends Case Study: Vodacom Community Phone Shops in South Africa*, www.digitaldividend.org
[7] In this, we follow the endogenous growth literature, which postulates increasing returns to human capital.

period. Instead one has to use data analysis, instrumental variables and statistical tests to determine whether there is any reverse causality present.[8]

Existing literature

The notion that telecoms infrastructure is an important part of SOC is not new. Various researchers beginning with Hardy[9] in 1980, Norton[10] in 1992 and others[11] have all found that there is an "externality" component in enhanced fixed telecoms penetration – that is, GDP is higher, and growth faster in countries with more advanced telecoms networks. Of course, as noted, one has to worry about reverse causality in richer countries; there, as income rises, demand for luxuries such as a universal telephone service rises as well. Although these studies do not adjust for reverse causality, several facts bear out the existence of the telecoms externality. First, Hardy examined both radio and telephone rollouts, since if the telephone simply provides information, radio broadcasts might be good alternatives. Hardy found no significant impact of radio rollout on economic growth, in contrast to telephones. Secondly, telephones (unlike radios, for example) have strong network effects – the value of a telephone to an individual increases with the number of other telephone subscribers.

Hence, as networks grow, their social value rises. This suggests that the social return – the value to society of an additional person connected or of an additional dollar invested in the network – exceeds the private return to the network provider, if that provider cannot price so as to extract these externality values. The Roeller-Waverman paper shows strong network effects. In the OECD in from 1970 to 1990, incremental increases in penetration rates below universal service levels generated only small growth dividends. Only at near universal service (30 mainline phones per 100 inhabitants which is near 70 or so mainline phones per 100 households) were there strong growth externalities from telephone rollout.

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[8] The data requirements of the full 4 equation APF model are much larger than for the one equation endogenous growth model.

[9] Hardy, Andrew. "The Role of the Telephone in Economic Development." *Telecommunications Policy*, 1980, *4*(4), pp. 278-86.

[10] Norton, Seth W. "Transaction Costs, Telecommunications, and the Microeconomics of Macroeconomic Growth." *Economic Development and Cultural Change*, 1992, *41*(1), pp. 175-96.

[11] Among these others are Leff, Nathaniel H. "Externalities, Information Costs, and Social Benefit-Cost Analysis for Economic Development: An Example from Telecommunications." *Economic Development and Cultural Change*, 1984, *32*(2), pp. 255-76. And Greenstein, Shane and Spiller, Pablo T. "Estimating the Welfare Effects of Digital Infrastructure." National Bureau of Economic Research (Cambridge, MA) Working Paper No. 5770, 1996.

Several more recent papers extend this analysis to mobile phones – among these are Torero, Choudhary and Bedi[12] (2002) and Sridhar and Sridhar[13] (2004). Several points need to be made on this research.

First, for economies without many fixed lines, or where mobiles supplement low fixed-line rollout, there should be no inherent difference in the growth dividend of a phone, whether it is mobile or fixed. In developing countries, an additional phone, whether fixed or mobile, increases the small network size and adds to the economy's growth potential. Secondly, where mobile phones complement fixed lines (in advanced economies), their externality effects will probably be different from those found for fixed lines. As individual lifestyles change and as firms utilise mobiles in productivity-enhancing ways, we should see new economic growth from mobile networks as well. For penetration rates of fixed lines are not 100 percent in developed economies. For example, in the USA in 1995, the penetration rate was 60 phones per 100 people. Mobile phones move the developed economies closer to universal service because pre-pay contracts allow exact monitoring of use, something very difficult to manage with fixed-line phones, making them accessible to other groups of users.

Some of the recent empirical studies specifically examine the impact of mobile phone expansion on growth in developing countries, using the Roeller-Waverman (RW) framework. Three caveats must be mentioned here. First, in many of these countries, growth has been low due to a host of issues – poor governance, lack of capital, low skill levels, and the like. It is difficult to show that mobile telephony increases growth rates where growth is low. Secondly, advances in telecoms penetration rates in developing countries are recent, so there is little real trend as yet. Finally, since mobiles are so new, there has been extremely rapid growth in mobile penetration starting from zero. Thus, if one tries to explain economic growth by changes in capital, labour, education and mobile phones, one could find either that *all* economic growth is due to the explosive growth in mobile phones, or conversely that mobile phones *decrease* growth since their use increases so quickly with little underlying economic growth occurring. Good econometrics requires careful consideration of underlying facts.

[12] Torero, Maximo; Chowdhury, Shyamal and Bedi, Arjun S. "Telecommunications Infrastructure and Economic Growth: A Cross-Country Analysis." Mimeo, 2002.
[13] Sridhar, Kala S. and Sridhar, Varadharajan. "Telecommunications Infrastructure and Economic Growth: Evidence from Developing Countries, National Institute of Public Finance and Policy (New Delhi, India) Working Paper No. 14, 2004

Sridhar and Sridhar (2004) apply the RW Framework to data for 28 developing countries over the twelve-year period 1990 to 2001. The average compounded annual growth rate (CAGR) of GDP per capita in this period was *minus* 2.03 per cent, while the CAGR of mainlines was 6.60 and of mobile phones 78.0 percent. In their regression, they find that mobile phones explain all growth – a 1 percent increase in mobile phones penetration increases growth by 6.75 percent. Below, we provide our own analyses of the RW aggregate production function approach. We do find more plausible although still exceedingly high impacts of mobile phones on growth. But the result is not robust to alternative specifications or to changes in countries included in the sample, and we do not rely on these estimates to draw any conclusions. We provide the APF model also to show the demand equation estimates – these are also most interesting, and robust.

The Aggregate Production Function

In order to estimate the impact of mobile phones in developing countries, we gathered information from the World Bank's World Development Indicators (WDI) database for basic variables such as GDP, population, labour force, capital stock and so on for both low-income and lower-middle-income countries. The International Telecommunication Union (ITU) produces a World Telecommunications Indicators database, updated annually, and we used this for data on our major telecoms-related variables – such as revenue, investment, and subscriber numbers. We also relied on the World Bank's Governance Indicators, so that we could incorporate some measures of institutional quality, which most certainly has an impact on growth. We included 38 developing countries for which full data are available for the period we used is 1996 to 2003.[14]

The framework employed was a three-equation modification of the Roeller-Waverman approach. **Appendix A** provides further details. We summarise briefly the model that we used:

[14] Since the production function approach is so data-intensive, the sample used in this regression consisted of 38 countries and 260 observations. Even from this sample, 95 observations were eliminated in the course of the regression analysis due to missing data. Of these 38 countries, 19 are low income countries (Bangladesh, Benin, Burkina-Faso, Central African Republic, Cote d'Ivoire, Gambia, India, Indonesia, Kenya, Lesotho, Madagascar, Mali, Mozambique, Myanmar, Nepal, Pakistan, Senegal, Tanzania and Vietnam) and 19 are lower middle income countries (Armenia, Bolivia, Brazil, China, Colombia, Egypt, Fiji, Iran, Jordan, Morocco, Namibia, Peru, Philippines, South Africa, Sri Lanka, Swaziland, Thailand, Tunisia, and Turkey).

1. The **Output** equation models the level of output (GDP) as a function of the total physical capital stock net of telecoms capital, the total labour force, a variable that captures the extent of the “rule of law”, and the mobile telecoms penetration rate. To account for the fact that output generally increases over time, we included a time trend term. We also included indicator variables capturing the level of external indebtedness of the country (there were three levels – High, Medium and Low). Roeller and Waverman used a dummy variable for each country (a so-called “fixed effects” or “Least Square Dummy Variables” approach). This approach controls for unobservable or otherwise unmodelled characteristics that are peculiar to each country; our approach here is similar in spirit, since it captures the impact of particular characteristics (such as the indebtedness level) on output.[15]

2. The **Demand** equation models the level of mobile telecoms penetration as a function of income (the level of GDP per capita), mobile price (revenue per mobile subscriber), and the fixed-line price (which is revenue per fixed line subscriber). The demand equation also allows for a time trend, since demand for a new product such as mobiles could also feature a strong trend.

3. The **Investment** equation simplifies the Roeller-Waverman “supply” and “investment” equations. It assumes that the growth rate of mobile penetration depends on the price of telecoms (the relationship should be positive since higher prices should invite additional supply), the geographic area (the relationship should be negative), and a time trend term.

We estimated the system of equations described above using the Generalised Method of Moments (GMM) method.[16] This approach uses all the exogenous variables in the system of equations (*i.e.,* those that we can reasonably assume are not determined by the other variables in the system, such as the amount of labour and the amount of total capital) as “instruments” for the endogenous variables (output, the level of mobile and fixed penetration, and the mobile and fixed prices). [17]

[15] Because we had very few observations for some of the countries in the sample, a model with full fixed effects collapsed.

[16] GMM estimation offers some advantages in terms of efficient estimation and ability to correct for serial correlation over other methods available for estimating a model comprised of a system of equations.

[17] Instrumenting the endogenous variables essentially involves isolating that component of the given endogenous variable that is explained by the exogenous variables in the system (the “instruments”), and then using this component as a regressor.

The results for the output and demand equations from running this GMM regression are summarised in **Tables 2** and **4** respectively (see **Appendix A** for the full set of results):

Table 2: Output Equation (Dependent variable is log of output)

Variable	Coefficient	T-Statistic
Capital	0.776	13.79
Labour	0.204	3.91
Mobile Penetration[18]	0.075	3.60

The coefficients obtained above are encouraging at first glance. The coefficients on capital and labour sum to close to 1, which is roughly consistent with the standard hypothesis of constant returns –to scale for the economy as a whole. The coefficient of the log of mobile penetration (which is a transformed version of the original variable) is 0.075. However, the interpretation of this is not straightforward: the impact of penetration on output depends on the level of penetration.

Table 3 shows the average levels of mobile penetration and GDP in those countries that the ITU classifies as "Low Income" and "Lower-Middle-Income" for 1996 and 2002 respectively.[19] For the average country, with a mobile penetration of 7.84 phones per 100 population in 2002, the coefficient of 0.075 on the transformed mobile penetration variable implies that a doubling of mobile penetration would lead to a 10 percent rise in output, *holding all else constant*.

Table 3: Mobile Penetration and GDP for "average" developing country, 1996-2002.

Year	Mobile Penetration	GDP
1996	0.22	$41 billion
2002	7.84	$47 billion

[18] Following Roeller-Waverman, we used a transformed and "unbounded" version of the penetration variable, namely (PEN/0.35-PEN) in the regression analysis. We do so to increase the range of the observed penetration rates.
[19] It should be noted that this is a larger set of countries than we were able to include in our actual regression analysis.

Considering that the average CAGR of GDP in these nations has been roughly 2 percent, this seems to high an estimate of the impact of mobile penetration. A growth rate of GDP of 2 percent over 8 years for the average country would imply total (compounded) growth of 19 percent. Meanwhile, the average CAGR of mobiles has been 64 percent in these same countries: mobile penetration more than doubles every two years in the average country. Given the estimated impact of mobile penetration presented in Table 2, if a developing country were enjoying "typical" growth rates of GDP and mobile telephones, then increased mobile penetration explains *all* the growth over the sample period.

The problem here is the one of weak output growth in many of the countries, but robust growth in mobile phone penetration. The model does not adequately control for the other factors affecting growth in the economy.[20] We attempted to extend the sample – both by adding more countries and increasing the time period back to 1980,[21] and also to modify the specification somewhat, but the results did not prove robust to either changes in the sample or changes in the model specification.

On the other hand, the demand equation from the aggregate production function model always performed well. **Table 4** shows the results of the GMM estimation for the demand equation:

Table 4: Demand equation (dependent variable is mobile penetration)

Variable	Coefficient	T-Statistic
Mobile Price	-1.50	-6.06
Fixed-line price	0.31	2.79
GDP per Capita	1.95	23.30

Table 4 shows that mobile demand falls when the price of mobiles increases, but increases when the price of fixed lines increases, suggesting that there is substitution between fixed line telephony and mobiles. Mobiles demand is also strong positively correlated with increases in income. The equation is in double-log form so

[20] Appendix A shows the sign on the time-trend term is negative and statistically significant, implying that there is large-scale technological regression: unlikely and troublesome. This also suggests that the mobile penetration rate variable is explaining too much growth.

[21] Since there were no mobiles in 1980, we ran a model for the effects of total telecoms penetration with the demand equation adjusted so that both fixed lines and mobile demand are estimated when mobile penetration is non-zero.

the coefficients can be interpreted as elasticities of demand, at the average penetration rate.

The own-price-elasticity of mobile phones is minus 1.5, which implies that demand is elastic: a 10 percent price increase would reduce demand by roughly 11.6 percent for a country in which mobile penetration is about 8 percent, the average level of mobile penetration for the developing countries.[22] The cross-price elasticity between mobile and fixed lines is positive, indicating that in these countries, mobiles and fixed telephones are substitutes: an increase in the price of fixed-line phones by 10 percent increases the demand for mobiles by 2.4 percent, assuming mobile penetration at the "average" level of 8 percent. Moreover, mobiles are 'luxuries' (in the technical sense) as the income elasticity is significantly above one – for the "average" developing country with 8 percent mobile penetration, a 1 percent increase in per capita GDP is associated with a 1.5 percent increase in the level of mobile penetration. The structure of the demand equation is much simpler than that of the output equation and since the equation deals with demand for one particular characteristic – mobile penetration – it is relatively easier to capture the factors that affect this demand than it is to capture all the factors that serve to increase or reduce output over time.

Ultimately, though, in light of the problems with the APF approach, especially the significant difficulties of obtaining adequate data across a large group of developing countries, we turn to the endogenous growth model.

The Endogenous Growth Model

We follow the work of Barro,[23] who ran growth regressions for a cross-section of countries for the time period 1960 to 1985. The basic questions Barro was addressing were two-fold: was there 'convergence' between rates of growth between poorer and richer countries as economic theory predicts; and how did differences in skill levels affect growth rates? Barro took average growth rates of per capita GDP for a cross-section of 98 countries and regressed these growth rates against regressors which included initial levels of GDP per capita and human capital stock,[24]

[22] Since we use a transformed version of mobile penetration, the impact of an increase in GDP per capita or increase in the price level varies according to the level of mobile penetration.
[23] Barro, Robert J. "Economic Growth in a Cross Section of Countries." *The Quarterly Journal of Economics*, 1991, *106*(2), pp. 407-43.
[24] Measured by school enrolment rates in 1960.

the average government consumption to GDP ratio for the period 1970-1985, and measures of stability.[25]

Barro found that, conditional on the initial human capital stock, average GDP per capita growth was negatively correlated with initial GDP per capita.[26] Thus, all else equal, poorer countries should close the income gap with richer countries, albeit only over long periods of time. The initial level of human capital stock was positively correlated with GDP per capita growth, so countries that were initially rich might actually grow faster than poorer countries if there were sizeable differences in their initial endowments of human capital. Only by controlling for these differences could he verify that there is indeed economic convergence between richer and poorer nations.

Our approach is similar. We took the average growth rate of per capita GDP from 1980 to 2003 as our dependent variable, and regressed this average growth rate on variables which included the initial level of GDP, the average ratio of investment to GDP, the stock of telecoms in 1980 (measured by the level of fixed-line penetration in 1980), the proportion of the 15-and-above population that had completed *at least* primary schooling in 1980, and the *average level* of mobile penetration for the period 1996 to 2003 (the period in which mobile penetration increased rapidly). Our sample consisted of 92 countries – developing and developed alike. The data came from the same sources – the World Development Indicators and the ITU – that we used for the APF estimation.

We are not primarily examining the issue of 'convergence' in income levels but instead in whether the increase in mobile penetration increases growth rates, and whether it does so equally in rich and poor countries. As mobile growth starts in essentially the same recent period for all countries, rich and poor alike, this is an interesting and important question. Our hypothesis is that increased mobile rollout should have a *greater* effect in developing countries than in rich countries. The reason is simple: while in developing countries the benefits of mobile are two-fold –

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[25] The average numbers of revolutions per year and assassinations per million population during the sample period.

[26] Standard neoclassical growth theory predicts long-run convergence of income levels between countries as richer, more capital-intensive countries run into the problem that the returns to capital diminish beyond a certain level of capital intensity. In the later growth literature, initiated by Romer (1986), there are increasing returns to particular factors- such as human capital- that also play a significant role in determining the speed of convergence. See Romer, Paul M. "Increasing Returns and Long-Run Growth." *Journal of Political Economy*, 1986, *94*(5), pp.1002-37.

the increase in the network effect of telecoms *plus* the advantage of mobility — in developed economies the first effect is much more muted.

In this model, there are no mobile phones in 1980, as there is for other stock variables (*e.g.,* we have proxied the stock of human capital in 1980, and have included the stock of telecom capital in 1980). We can assume that the 1980 levels of human and telecom capital are exogenous – that is, they ought not to be the result of income growth between 1980 and 2003.[27] We cannot, however, assume that there is no reverse causality between income growth in the 1980 to 2003 period and average mobile penetration over a portion of the same period with quite the same safety. Thus, mobile penetration is potentially endogenous, and we must examine whether or not this is so.

We started with an initial specification that did not attempt to capture differential effects of telecoms between developing and developed countries. **Table 5** (also reported in fuller form in **Appendix B**) reports the results of a simple Ordinary Least Squares (OLS) regression:[28]

Table 5: Baseline results from the ETC model (dependent variable is average per capita GDP growth)

Variable	Coefficient	T-Statistic
GDP80	-0.0026	-4.00
K8003	0.0017	4.73
TPEN80	0.0418	1.63
MPEN9603	0.0003	2.76
APC1580	0.0002	2.43
Constant	-0.0289	-3.93

Table 5 shows that the average GDP growth rate between 1980 and 2003 was positively correlated with the average share of investment in GDP (taken over the entire period), with the 1980 level of primary school completion, and with the average level of mobile penetration between 1996 and 2003. It was negatively correlated with the level of initial GDP per capita (GDP80). The results confirm Barro's convergence hypothesis: conditional on other factors such as human capital and physical capital endowments (captured by school completion rates and telecom penetration), poorer countries grow faster than richer ones. Every additional $1,000

[27] However, it is possible that these variables proxy for subsequent flows of income into human and telecom capital, a subtlety that Barro (1991) explored for human capital, and rejected.
[28] All results are corrected for heteroscedasticity.

of initial per capita GDP reduces average growth by roughly 0.026 percent. Considering that average growth is typically in the 1 to 2 percent range, a $10,000 difference in initial per capita GDP would imply growth that would be 0.26 percent lower, which is a substantial difference in the light of typical rates of growth.

The initial level of telecoms (*i.e.,* fixed line) penetration was not significant in this model (TPEN80). However, the average level of mobiles penetration (MPEN9603) was significant – a unit increase in mobile penetration increased growth by 0.039 percent, all else being equal. In line with Barro, the coefficient on primary school completion (APC1580) was positive and significant.

As mentioned above, we were concerned about a potential problem of endogeneity of the mobile penetration rate (as a regressor). We performed a Hausman test,[29] which showed that endogeneity was not likely to be an issue.[30] (See Appendix B for fuller details of the IV estimates and the Hausman test).

Having tested for endogeneity, we then divided the sample into four income quartiles according to their level of GDP per capita in 1980. We classified countries as "low income" (or potentially fast-growth) if they were in quartiles 1, 2 or 3, while quartile 4 countries were classified as "high income." Our "low income" sample included a mix of some countries that had (and still have) much catching-up relative to the highest-income nation, and some countries (like Hong Kong) that were on the verge of becoming advanced economies in 1980. We created dummy variables for high and low income countries and then split the effects of penetration by generating new variables that were the product of these dummy variables and initial telecoms penetration, and the dummy variables and average mobile penetration from 1996 onwards. **Table 6** (reported also in Appendix B) illustrates the results:

[29] Loosely speaking, the Hausman test computes the "distance" between an estimator that is potentially inconsistent under the alternative hypothesis of endogeneity bias and one that is always consistent. See Hausman, Jerry. "Specification Tests in Econometrics." *Econometrica*, 1978, *46*(2), pp. 1251-71.

[30] In this context, the Hausman test compares the OLS estimates with estimates from an instrumental variables regression (IV). We used average fixed line penetration between 1960 and 1979 as an instrument for average mobiles penetration between 1996 and 2003: the correlation coefficient between the two variables is 0.81.

Table 6: Table 5 regression separating out effect of telecoms variables

Variable	Coefficient	T-Statistic
GDP80	-0.0025	-3.68
K8003	0.0018	4.67
TPENH80	0.0005	1.92
TPENL80	-0.0002	-0.32
MPENL	0.0006	2.46
MPENH	0.0003	1.99
APC1580	0.0002	2.22
Constant	-0.0284	-3.83

Here, we found that the effect of initial telecoms stock in 1980 was not significant for the low-income countries (TPENL80) but was almost significant (at the 5 percent level) for high-income countries.[31] This is to be expected in view of the fact that fixed penetration was extremely low for low-income countries in 1980 (an average of 3.3 main telephone lines per 100 inhabitants).

The coefficient on the average mobile penetration from 1996 to 2003 (MPENL for low-income countries and MPENH for high-income countries) was positive and significant for both cases, but the impact was twice as large for the low-income countries. The results suggest a noticeable growth dividend from the spread of mobile phones in low-income and middle-income countries.

All else equal, in the "low income" sample[32], a country with an average of 10 more mobile phones for every 100 people would have enjoyed a per capita GDP growth higher by 0.59 percent. Indeed, the results suggest that long-run growth in the Philippines could be as much as 1 percent higher than in Indonesia, were the gap in mobile penetration evident in 2003 to be maintained. The Philippines had 27 mobile phones per 100 inhabitants in 2003, compared to 9 per 100 in Indonesia. Another estimate of the importance of mobiles to growth can be seen by comparing Morocco to the "average" developing country. In 2003, Morocco had 24 mobile phones per 100 inhabitants, compared to 8 in the typical developing country. Were this gap in

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[31] This is also consistent with Roeller and Waverman (2001) who report an inability to derive consistent results for low-income countries.

[32] Because data for more advanced countries is more widely available, and because we only treated the very advanced nations (top quartile) of 1980 as "high income", our "low income" sample probably underweights the most underperforming developing countries and overweights middle-income countries. Clearly, better data availability – particularly of historical data – would enable us to expand our sample and thereby gauge how robust our results really are.

mobile penetration maintained, then Morocco's long-run per capita growth rate would be 0.95 percent higher than the developing country average.[33] Thus, current differences in mobile penetration between developing countries might generate significant long-run growth benefits for the mobile leaders. Finally, while Argentina and South Africa both had disappointing economic performance over the 1980 to 2003 period, both registering negative average growth in per capita incomes, the analysis suggests that South Africa's higher level of mobile telecoms penetration over the period (17 for South Africa versus 11.4 for Argentina) prevented this difference from being even larger – South Africa's negative average per capita growth of 0.5 percent compares with Argentina's negative average per capita growth of 0.3 percent, but this difference would have been 0.3 percent wider had it not been for the greater spread of mobiles in South Africa.

For the high-income countries, mobile telephones still provide a significant growth dividend. Sweden, for example, had an average mobile penetration rate of 64 per 100 inhabitants during the 1996 to 2003 period, whilst Canada had a mere 26 per 100 average penetration rate. All else equal, Canada would have enjoyed an average GDP per capita growth rate 1 percent higher than it actually registered, had it been able to achieve Swedish levels of mobile penetration over the 1996 to 2003 period.

Conclusions

In summary, telecommunications is an important prerequisite for participation in the modern economic universe. There is a long-standing literature attempting to gauge the economic impact of telecommunications, with the findings of Roeller and Waverman (2001) suggesting a substantial growth dividend in OECD nations.

We have modelled the impact of mobile telecommunications in poorer countries, since in these countries mobile phones are fulfilling the same role as fixed lines did previously in the OECD nations. Initially we attempted to use the Roeller-Waverman framework, but data problems and econometric problems made it difficult to get truly sensible estimates of the growth impact of mobile telecommunications

[33] It should be noted that Morocco is not part of the sample from which our results were actually derived.

that were also robust to changes in the sample and small changes in the specification of the model.

We turned to a purely cross-sectional model that looked at long-term averages of growth, and our results were more robust and sensible than under the previous framework.[34] They suggest the following:

- Differences in the penetration and diffusion of mobile telephony certainly appear to explain some of the differences in growth rates between developing countries. If gaps in mobile telecoms penetration between countries persist, then our results suggest that this gap will feed into a significant difference in their growth rates in future.
- As Romer (1986) and Barro (1991) hypothesised for human capital stocks, there are also increasing returns to the endowment of telecoms capital (as measured by the telecoms penetration rate).
- Given the speed with which mobile telecoms have spread in developing nations, it is unlikely that large gaps in penetration will persist forever. However, differences in the speed of adoption will affect the speed with which poor countries converge to rich countries' level. Relative poverty still poses serious political problems, such as instability and increased demand for emigration. Our analysis suggests the need for regulatory policies that favour competition and encourage the speediest possible rollout of mobile telephony.

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[34] However, we need to examine whether our sample can be expanded, and while we have tested for the endogeneity of the mobile phones penetration variable, we still need to examine some more subtle issues such as the potential endogeneity of some of the other regressors. We also need to test for the possibility that some third factor (such as institutional quality) that we have not captured influences both growth and the level of mobile penetration, thereby generating a spurious relationship between the two.

Enclosure

(3 of 3)

ICT POLICY DIVISION
GLOBAL INFORMATION AND COMMUNICATIONS DEPARTMENT (GICT)

THE ROLE OF MOBILE PHONES IN SUSTAINABLE RURAL POVERTY REDUCTION

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Authors:
(in alphabetical order)
Asheeta Bhavnani
Rowena Won-Wai Chiu
Subramaniam Janakiram
Peter Silarszky (TTL)

Practice Leader:
Deepak Bhatia

Table of Content

1 Introduction

1.1 Abstract & Overview

Many developing country governments and developing agencies are focusing on extending telecommunications services into rural areas, as they seek to alleviate poverty, encourage economic and social growth, and overcome a perceived ‘digital divide’. However, relatively little is known about how rural communities benefit from modern telecommunications services and what impact it is having on their lives and livelihoods. This paper endeavors to redress the balance, by examining the role of mobile telephones in sustainable poverty reduction among the rural poor.

In the first section, we ask three questions: (a) Why are the rural poor important?; (b) What is information and why is it important?; and (c) Is the mobile telephone the most appropriate delivery mechanism for that information? In the second section, we look at the current status of the mobile industry in both the developed and developing world: (a) we consider the ‘explosive’ growth in availability and affordability of mobile phone services, which has been high in the developed world, but is gaining speed in the developing world; and (b) we examine the role of the private sector in this impressive growth. In the third section, we drill down into the impact of mobile telephony. We begin by examining the perceived correlation between GDP per capita and mobile penetration. Then we turn our attention to the examination of channels through which mobile phones benefit the rural poor: (a) direct benefits; (b) indirect benefits; and (c) intangible benefits, which contains an overview of hard-to-measure, rarely discussed but relevant, benefits of mobile telephony: namely, disaster relief, dissemination of locally-generated and locally-relevant educational and health information, and social capital or social cohesion. In the fourth section, we review several emerging global trends that may change the use and impact of mobile telephony in rural areas. Finally, the fifth section summarizes and interprets the main conclusions.

1.2 Why the Rural Poor?

Three of every four poor people in developing countries live in rural areas, i.e., 2.1 billion living on less than $2 a day and 880 million on less than $1 a day.[1] Thus, any comprehensive poverty reduction strategy has to address rural poverty. This paper makes the argument that it is important to include ICTs for the rural poor into these stretegies due to the potential impact ICTs can make on their lives and livelihoods.

Arguably, the *value* of mobile phone services and the associated benefits are higher in rural areas. One benefit, which we will be discussing later in the paper, is substitution for transport. Although the rural poor are not a homogenous group – consisting of artisans, farmers, fishermen, herders, migrant workers, and indigenous people – one common element is their lack of affordable access to relevant information and knowledge services. This lack of access can lead to other contributors to poverty (e.g., ignorance of income-earning or market opportunities and inability to make their voices heard).

[1] World Development Report 2008: Agriculture for Development, The World Bank, 2007

1.3 Why Information?

The lack of affordable access to relevant information and knowledge services among the rural poor has been a concern to development economists for some time. Traditionally, information is regarded by economists as a critical element in the efficient functioning of markets. For example, the first fundamental theorem of welfare economics (i.e., competitive equilibria are Pareto efficient) and the law of one price (i.e., the price of a good should not differ between any two markets by more than the transport cost between them) are based on the assumption that economic agents have the necessary information (Jensen 2007). Moreover, access to information is essential for the emergence of global information and knowledge based economy and has the ability to empower poor communities, enhance skills, and link various institutions involved in poverty reduction. Despite this being widely recognized, access to information has been limited in reality and very few empirical studies exist which assess the impact of investments aimed at providing access to information.

Despite the increasing rural demand for relevant and timely information and market knowledge and recent advances in information and communication technologies (i.e., their declining costs and increasing speed, efficiency and user-friendliness) that opened a wide range of opportunities to meet this demand and to improve the livelihoods of rural poor, the benefits from ICT investments have been unevenly distributed between and within countries resulting in what has become to be widely known as the *digital divide* and *information poverty*. Most of the beneficiaries of the ICT revolution have been those with resources and skills leaving out the majority of the rural poor. There are several underlying causes for this situation, which fall under the following broad categories:

(a) <u>Institutional Environment Constraints</u>: The enabling policy and regulatory environment is often not conducive to stimulation of competition and increased private sector involvement in the provision of ICT infrastructure and services to rural communities. Typically, there is also a lack of well-developed and functioning institutional mechanisms to implement the policies and regulation; lack of locally relevant easy to understand content in local language; and lack of well-trained human resources to develop applications and service the end-users.

(b) <u>Rural Infrastructure Constraints</u>: Rural ICT infrastructure is often underdeveloped, due to the high costs of last mile connectivity in rural areas, intermittent and unreliable power, and low priority for ICT investment, due to other more pressing needs in the rural sector.

(c) <u>Rural Population Constraints</u>: The characteristics of the rural population themselves are not conducive to ICT absorption. Barriers include: low population density and remoteness, low levels of functional literacy, little or no basic or computer literacy, low awareness, low disposable income, poor health and living conditions, and constant struggle for survival.

(d) <u>Rural Poverty Reduction Strategy Constraints</u>: Finally, ICT is not an area that has been well-integrated in rural poverty reduction strategies: often narrowly defined as modern technologies (e.g., computers & the internet) and the more traditional technologies (e.g., fixed line telephone, radio & television) have not yet themselves been fully exploited.

1.4 Why Mobile Telephony?

Given the unprecedented growth of affordability and coverage of mobile telephony services and its increasing importance as a means of two way communication, the scope of this paper is limited to the role of mobile telephony in sustainable rural poverty reduction in developing countries. The focus on mobile telephony is further justified by the following facts:

(a) Affordability (Demand-Side): The many pricing models offer affordability and choice, even for very low-income customers (cheap handsets, micro prepayments, top-up cards). Innovative ways of mobile phone access, which allow sharing of phones through SIM cards and payments for air time through micro-prepayment, promote even more rapid adoption by the poor;

(b) Affordability (Supply-Side): Establishing mobile masts is a relatively inexpensive way of serving large & remote rural areas, compared to last mile cable for fixed line telephony.

(c) Flexibility: It is not pricing models that are flexible: usages are also. Mobiles can be used for text and voice and are two-way communications (i.e., more flexible than radio/TV).

(d) Low Barriers to Entry: In response to factors above, mobile has become the most easily accessible and ubiquitous communications device in rural areas. Easy availability of low priced new handsets with basic features and emergence of secondary markets for used devices, whose prices are even lower, make them within reach for even the poorest of the poor.

2 Status of the Mobile Telephony Sector

2.1 The Mobile Industry in the Developed World

Mobile phones have become the primary form of telecommunication in both developed and developing countries. Globally, mobile phone networks play the same role that fixed-line phone networks did in facilitating growth in Europe & North America in the 20th century. The industry has experienced explosive growth in a relatively short time span. The first billion mobile phones took around 20 years to sell worldwide. The second billion were sold in four years. The third billion were sold in two years. Coverage has expanded and mobile phone subscriptions in developing countries have increased by over 500% since 2000 (Wireless Intelligence 2007). It is estimated that over 50% of the world's population will own a mobile phone and that 80% of the world's population will live within the range of a cellular network, by the end of 2008. The projections for future performance are simnilarly impressive to those tracking past performance. By 2010, GSMA projects that 90% of the world will be covered by mobile networks and mobile communication will deliver data, internet and voice services to more than 5 billion people by 2015 – double the number connected today (GSMA, 2007).

In 2002, mobile phone subscribers overtook fixed line subscribers to provide communication services in the world as shown in Figure 1. This was due to the relatively low cost of adding new subscribers to the cellular network (mobiles are much more scalable than fixed-line phones) and the premium placed on mobility.

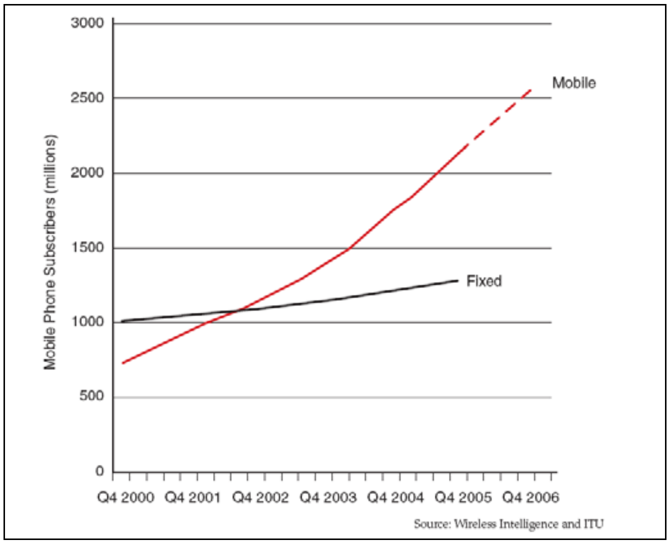

Figure 1: Growth of Worldwide Fixed & Mobile Phone Subscribers (2000-2006)
Source: GSMA 2006
http://www.gsmworld.com/documents/public_policy/regulation/regulation_and_digital_divide_v3.pdf, page 14

The main driver of this explosive growth was and continues to be private sector investment in the mobile phone sector, assisted by a favorable enabling legal and regulatory environment. The private mobile operators provide services which cater to the demand of consumers and generate profits for manufacturers and operators alike. This enables the mobile industry to be a fast-changing one, responsive to advancements in technology and the mounting sophistication of consumer tastes.

Figure 2 lists the Top 13 global mobile phone companies which together have a cumulative base of 789 million subscribers. As the developed world reaches saturation point, major mobile companies have their eye on the next prize – a fast-growing mobile subscription base in the developing world.

Company	Main Technology Used	Number of Subscribers (million)
China Mobile	GSM	158.6
Vodafone	GSM,UMTS	151.8
China Unicom	IS-2000,GSM	100.1
T-Mobile	GSM,UMTS	65.0
Cingular	IS-136,GSM,UMTS	49.1
Orange	GSM,UMTS	49.0
NTT DoCoMo	PDC,FOMA	45,9
Verizon Wireless	IS-2000	42.1
Mobile telesystems	MTS (GSM)	34.22
Vivo	IS-136	26.0
Turkcell	GSM	23.4
Sprint PCS	IS-2000	22.2
MmO2	GSM	21.3

Figure 2: The World's Major Mobile Phone Companies
Source: http://www.funsms.net/largest_mobile_phone_companies.htm

2.2 The Mobile Industry in the Developing World

Studies by the International Telecommunications Union indicate that of the world's mobile subscribers only 33% were in the developed world with the remaining 67% in the developing world at the end of 2006. Similarly to patterns observed in the developed world, the developing world has also experienced explosive growth in terms of mobile phone take-up.

Past Growth: Figure 3 below shows the growth in mobile subscriptions by major world regions for 2001-2005. Growth rates have been the highest in North Africa and the Sub-Saharan Africa region attributable to the very limited usage in earlier years. By 2005, there were approximately 83 million subscribers in Sub-Saharan Africa but in majority of the countries mobile penetration was below 10% reflecting a large and untapped potential for future growth and investment opportunities. In 2005, Stephen Yeo, the Chief Executive of the Centre for Economic Policy Research, spoke of the 'leapfrog effect' that mobile phones had achieved over old technologies in Africa: 'The result is explosive growth: 5000% between 1998-2003'.[2]

Region	2001	2002	2003	2004	2005
World	31	21	22	24	23
Americas	18	12	25	37	35
Asia Pacific	45	32	26	23	21
Europe	26	14	16	21	20
Middle East	36	30	23	27	33
USA/Canada	16	10	16	19	11
North Africa	64	32	36	49	70
Sub-Saharan Africa	59	48	47	54	49

Figure 3: Annual Growth in Mobile Subscriptions by World Regions (%)
Source: Wireless Intelligence

Present Growth: More recent figures, released this month by Total Telecom,[3] indicate still more explosive growth. In the first quarter of this year, the number of mobile phone users in Africa exceeded 280 million and is expected to reach 300 million by June 2008. Consequently, Africa has now surpassed North America in terms of the number of mobile subscribers (277 million subscribers in the US & Canada).[4] In Asia, mobile telephony has grown rapidly in India, especially during the last three years. Recent data from TRAI[5] indicates that the number of wireless subscriber has reached 250 million, making India the second largest wireless market in the world: second only to China, with teledensity already surpassing the 25% mark.

Future Growth: Future growth projections are also strong. Currently, China is adding about 6-7 million new subscribers per month, India about 8-9 million and the US about 2-3 million (CITA). Africa's mobile penetration rate is expected to increase from 15.37% in 2005 to 31% by 2011 and the number of Africa's mobile subscribers is expected to grow at a compound average growth rate of 13% between 2007 and 2011.[6]

[2] BBC News, Mobile Growth 'Fastest in Africa', www.bbc.co.uk (March 9, 2005)
[3] Kennighan, Mary, African Mobile Subscribers Reach 280m, *Total Telecom* (May 1, 2008)
[4] Note this statistic excludes Mexico, which has approximately 65 million mobile subscribers
[5] Telecom Regulatory Authority of India (TRAI), Government of India, New Delhi, Mar 2008, No 27/2008, www.trai.gov.in/trai/upload/PressReleases/549/pr24mar08no27.pdf
[6] Bharat Books, African Mobile Market Forecast (2007-2011), Aug 2007

Role of the Private Sector: One contributor to this phenomenal growth has been the involvement of a competitive private sector. From 1995 to 2002, the private sector invested $210 billion in telecommunication infrastructure in the developing world. In Africa, the majority telecommunication investment has come from the private sector. In 2003, the telecom sector accounted for more than a tenth of gross fixed capital formation in 4 out of the 9 countries covered in ITU analysis (see Figure 4).

Country	Telecommunications Investment in 2003 ($ million)	% of Gross Fixed Capital Formation
Benin	26.4	5.8
Burkina Faso	34.9	4.5
Kenya	188.6	10.5
Lesotho	7.1	3.3
Mali	17.7	3.0
Senegal	108.6	10.4
Swaziland	27.6	11.7
Togo	30.0	11.5
Uganda	68.0	4.9

Figure 4: Telecoms Investment in Selected Sub-Saharan Countries
Source: International Telecommunications Union (ITU)

The private sector is also active in India and there are a number of telecommunication companies providing mobile telephone services who have to compete for market share and meet consumer expectations. India's major companies and market share are illustrated below in Figure 5.

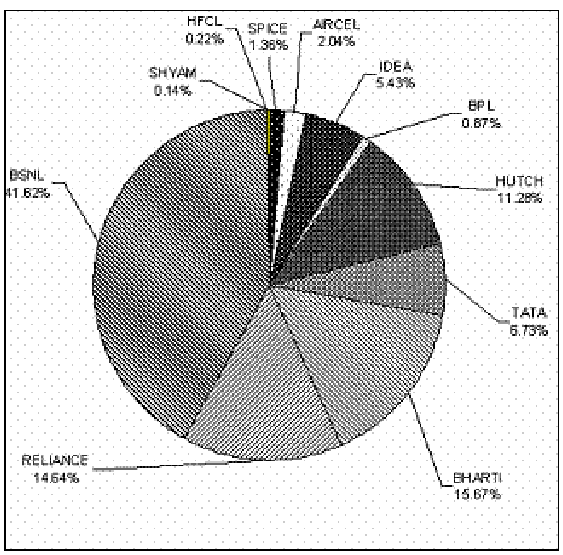

Figure 5: Private Sector Share in Mobile Services in India (%)
Source: Telecom Regulatory Authority of India (TRAI), Government of India, New Delhi

2.3 Different Needs of Developed and Developing World

In concluding Section 2, it is clear that the global market for mobile telephony is substantial. It has been estimated that the annual value of the current mobile market is about $700 billion and it is growing at about 10% per year. There are more than 2.5 billion mobile subscribers, representing a global penetration of 40%. The penetration ranges from over 100% in Western Europe to less than 10% in Africa and about 20% in Asia-Pacific (see Figure 6). However, future subscriber growth is expected almost exclusively from developing countries.

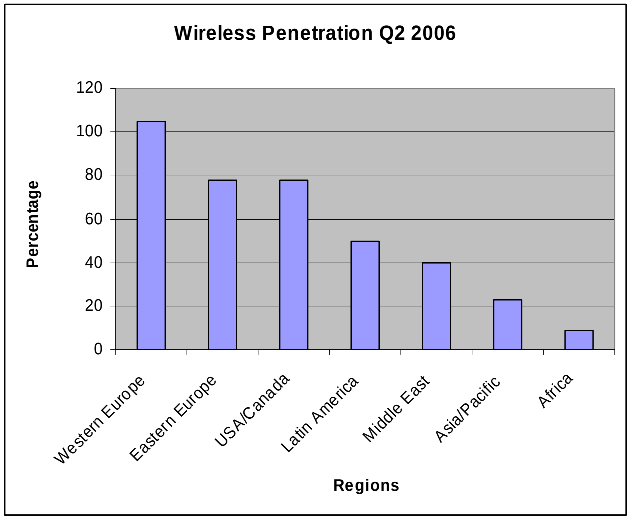

Figure 6: Wireless Penetration by Major Regions of the World
Source: Wireless Intelligence

Therefore, it is important to understand that the drivers of growth in the developed world may differ from the drivers of growth in the developing world. Traditionally, studies have shown that firms in countries with higher levels of income/productivity have higher incentive to invest in efficiency-enhancing ICT than firms in countries with low income levels. A number of factors influence the decision whether or not to invest in ICT. High costs, lack of competition, lack of relevant skills for effective use of ICT could all be inhibitors (Caseli & Coleman, 2001). Studies also show that levels of education are positively correlated with ICT diffusion. Gust and Marquez (2002) found that restrictions in labor/product markets affect levels of ICT investment.

Guerrieri (2003) found that financial conditions and income growth affect the uptake of ICTs. While these factors are relevant for the uptake of ICTs by the rural poor, because of the unique characteristics of the rural populations and rural regions different approaches involving the interventions of the Government and the private sector are needed. Possible interventions could include the public sector taking a role in: (a) creating an enabling environment for competition of service providers; (b) developing the communication infrastructure; (c) developing locally relevant content which meets the needs of the poor, and (d) providing education and training programs in IT enabled services to boost skills and training.

3 Impact of Mobile Telephony

Before we can make policy recommendations concerning the role of mobile phones in sustainable rural poverty reduction, let us consider some of the benefits (or impact) that results from the provision of affordable access to mobile telephony. Although, as we have demonstrated, mobile telecommunications is a substantial driver of economic growth, there are very few in-depth studies which have been carried out to document the impact of the mobile phones on economic development and on sustainable poverty reduction. This section makes an attempt to bring together a few of the existing impact evaluation studies and draw lessons from these for sustained development.

As we discussed in Section 2, economists traditionally believed that firms in countries with higher levels of income/productivity have higher incentive to invest in efficiency-enhancing ICTs than firms in countries with low income levels, i.e., that there is a strong correlation or linkage between high GDP per capita and mobile telephone penetration (see Figure 7).

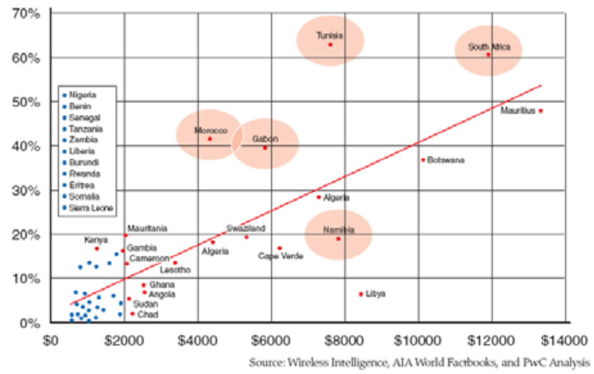

Figure 7: Mobile Telephone Penetration vs Per Capita GDP (PPP) (2005)
Source: AIA Factbook, PwC Analysis, Wireless Intelligence

However, as the above figure illustrates, a number of countries defy this analysis. Three countries performed better than expected – Morocco, Tunisia, South Africa:

(a) Morocco: Morocco's GDP is only half that of Namibia and yet its penetration is twice that of Namibia. Upon closer inspection, we see that Morocco exceed expectation due to private sector collaboration and a stable regulatory environment. On the other hand, Namibia suffers from a lack of competition and an uncertain regulatory environment.

(b) Tunisia: Tunisia has also made remarkable progress: from a low 10% penetration in 2002 to a high 60% penetration in 2005. The success was largely due to the liberalization of the mobile market: mobile licenses were issued for a 15 year period, which included the right to operate an international gateway and duopoly in mobile service provision.

(c) South Africa: South Africa has a per capita GDP of $12,000, which is a high income level, but it also has one of the best regulatory environments and penetration at around 60%.

More analysis of the developing world indicates that a low GDP per capita is not necessarily an indication of mobile penetration. In Africa, 8 of the 18 countries analyzed have achieved over 70% population coverage, despite per capita incomes of less than $1,000 (see Figure 8). The main drivers are: (a) small geographical area; (b) good market conditions; (c) conducive policy environment; and (d) high population density. In Asia, many countries with low per capita incomes have over 90% population coverage (see Figure 9). In Latin America, 8 of the 18 countries analyzed have achieved over 90% population coverage, despite low per capita incomes (see Figure 10).

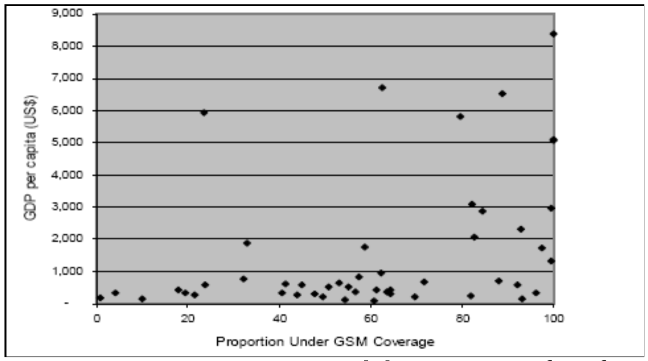

Figure 8: GDP Per Capita vs Mobile Penetration for Africa
Source: Universal Access – how mobile can bring communications to all, GSM Association study conducted by Intelecon Research, 2007, http://www.gsmworld.com/universalaccess/index.shtml

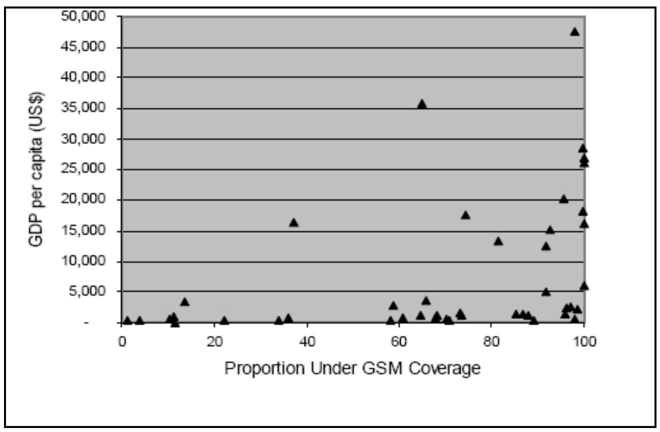

Figure 9: GDP Per Capita vs Mobile Penetration for Asia
Source: Universal Access – how mobile can bring communications to all, GSM Association study conducted by Intelecon Research, 2007, http://www.gsmworld.com/universalaccess/index.shtml

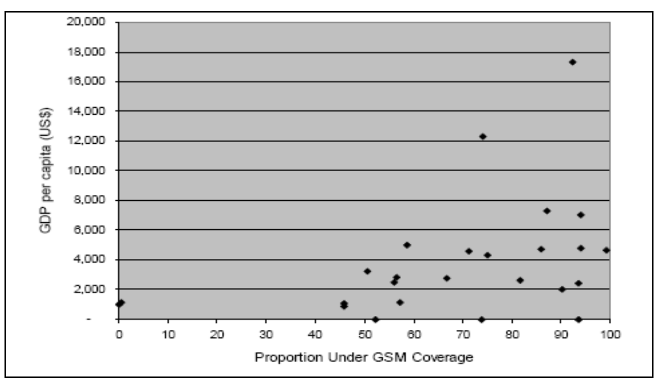

Figure 10: GDP Per Capita vs Mobile Penetration for Latin America
Source: Universal Access – how mobile can bring communications to all, GSM Association study conducted by Intelecon Research, 2007, http://www.gsmworld.com/universalaccess/index.shtml

The fact that the correlation between GDP per capita and mobile penetration is not as strong is indicative of two dwindling myths. First, there is the myth that the rural poor are not able or not willing to pay for mobile telecommunication services. Initially, this led to a tendency to invest in the more affluent urban areas rather than poor rural areas but now there are also growing rural networks in many developing countries. Second, there is the myth that natural barriers, such as lack of education or electricity, would prevent mobile take-up. Strong growth in many developing countries, in spite of still-prevalent difficulties with low education, low access to electricity and low income levels has also gone some way to refuting this theory.

Instead, economists have begun to believe that the **benefits** and **development impact** of mobile telephony outstrip these barriers. (This is not to say that these barriers no longer exist, but rather than developing economies have found ingenious ways around them, given the obvious benefits that the use of mobile telephony can bring, e.g., the lack of electricity in rural areas was believed to be an insurmountable barrier to mobile take-up. However, rural communities developed various ways to adapt to this obstacle: (a) collecting several mobiles from one community and heading to another village to charge them, as at an Issuana mission in Tanzania; (b) using car batteries to charge mobile phones.)

The evidence indicates that the benefits outweigh the constraints. Yet what are these benefits? We have divided our subsequent analysis of the benefits of mobile telephony into three categories: (a) direct benefits; (b) indirect benefits; and (d) intangible benefits (e.g., disaster relief, local content, low education, social capital and cohesion.). The case is built on evidence drawn from a series of policy papers, investigating the development impact of mobile telephony, produced by Vodafone (Mar 2005), Ovum (Apr 2006), McKinsey (Feb 2007) and Deloitte (Jan 2008). The papers build on one another, but categorize the benefits within one of the following dichotomies: economic & social, macro & micro, tangible & intangible.

3.1 Direct Benefits: The Economic or Macro-Level Case

Mobile telephony has a positive impact on the economic welfare in the following direct ways: (a) by generating GDP; (b) by job generation (both in the mobile industry and the wider economy); (c) productivity increases; and (d) taxation revenue (mobile operators are usually a sizeable contributor).

3.1.1 GDP Growth

Let us first examine the evidence that the use of mobile phones boosts overall GDP. Vodafone (2005) reported that, in a typical developing country, an increase of 10 mobile phones per 100 people boosts GDP growth by 6%. Ovum (2006) reported that the mobile services industry contributed Rs 313 ($7.8 billion) towards GDP in India. McKinsey (2007) estimated the contribution of mobile operators and mobile-related companies and reported that, in China mobile-related companies contributed twice as much to GDP, as mobile operators. Deloitte (2008) reported that, in all 6 countries analyzed (Bangladesh, Malaysia, Pakistan, Serbia, Thailand, and Ukraine) mobile phones had a significant impact on GDP.

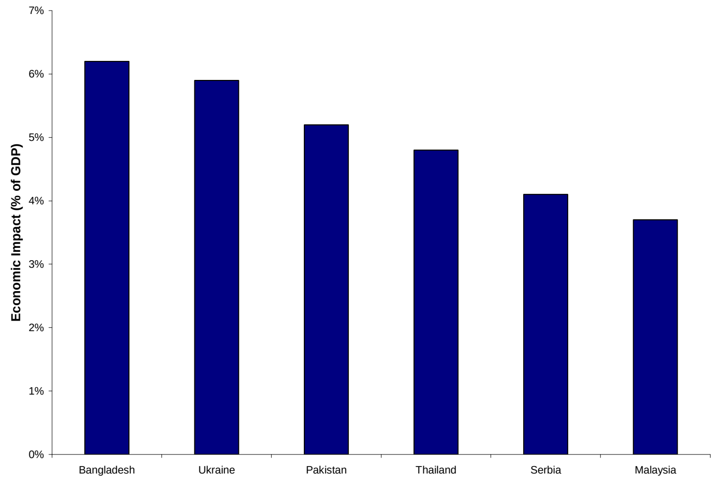

Figure 11: Economic Impact of the Mobile Communications Sector as a % of total GDP (2007)
Source: Deloitte, Economic Impact of Mobile in Bangladesh, Malaysia, Thailand, Pakistan, Serbia, and Ukraine

3.1.2 Job Creation

Another economic impact is the employment generation of the mobile telephony sector. Ovum (2006) found that the mobile telephony industry created about 3.6 million jobs in India, directly and indirectly. This figure is expected to increase by 30% per year. Deloitte (2008) found that, in the 6 countries analyzed, mobile sector employment in 2007 was significant, ranging from 244,000 FTEs[7] in Pakistan to 36,000 FTEs in Serbia (see Figure 12). Although the mobile operators themselves only create limited employment, jobs they do create are highly paid and sought after, and there is a major knock-on effect in retail (through the sale of airtime, handsets, and SIM cards).

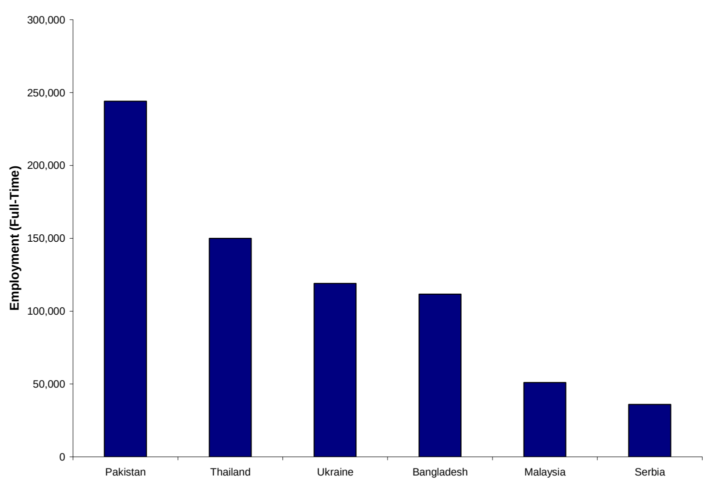

Figure 12: Contribution to Employment from the Mobile Value Chain
Source: Deloitte, Economic Impact of Mobile in Bangladesh, Malaysia, Thailand, Pakistan, Serbia, and Ukraine

[7] FTEs = Full Time Equivalents

3.1.3 Productivity

Productivity gains from the operation of mobile telephony can also be substantial. This is analyzed through a range of factors, e.g., the number of workers reliant on a mobile phone and the revenue or time savings that access to a mobile phone (instead of fixed line) may bring. Deloitte (2008) categorized the productivity benefits of mobile phones into five broad areas:

(a) Business Expansion: e.g., in the import/export & small trade business at Odessa Seaport, Ukraine, mobiles were a powerful tool to estimate demand and seek out new customers

(b) Employment Search: This is particularly important in countries such as Serbia, which has high unemployment (20%) or Thailand, with its high level of temporary employment

(c) Entrepreneurialism: Mobile phones reduce the cost of operating and starting up businesses. For example, beauticians in Pakistan, prostitutes in Serbia and taxi drivers in Thailand

(d) Mobile Banking: Mobile phones reduce the need to meet face-to-face to conduct business. For example, Wizzit in South Africa offers the option of total substitution of banking.

(e) Transaction Costs: Improvements in the information flows between buyers and sellers, allow for the exchange of information without traveling (we shall explore more later on).

3.1.4 Tax Revenue

In addition to the impact on GDP, there is also a benefit of direct taxation revenue. Ovum (2006) reported that the mobile telephony sector contributed Rs 145 billion ($3.6 billion) per year in import duties, licence fees, spectrum fees, and taxation revenues in India. Deloitte (2008) estimated the overall taxation revenue, by segmenting the benefit into taxation revenue from the mobile operators themselves, their supplier chain, and other industry retailers – and additional economic impact, dubbed ‘the multiplier effect’. They found that in all 6 countries analyzed, the direct tax contributions from the mobile operators outweighed those from indirect players, as government directly captured revenue from the operations of those companies. On average, mobile operators contributed 26% of total revenues in taxes. This rose to 29% when regulatory fees were included though this varied considerably (see Figure 13).

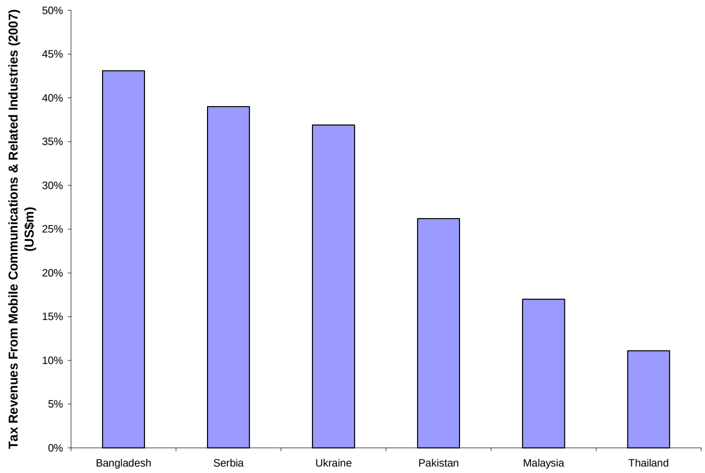

Figure 13: Tax Revenues from Mobile Communications & Related Industries (2007) ($ million)
Source: Deloitte, Economic Impact of Mobile in Bangladesh, Malaysia, Thailand, Pakistan, Serbia, and Ukraine

3.1.5 Value-Add from Mobile Operator

It is worth pointing out that there are some direct economic benefits from the mobile operator themselves in terms of contract costs, dividends, employee benefits, and wages. Deloitte (2008) conducted some analysis on Telenor, determining five categories of direct value-add from the mobile operator. These were: (a) contractor costs; (b) corporate social responsibility; (c) dividends; (d) regulatory and spectrum fees; amd (e) wages and employee benefits. Whilst they are outside the scope of this analysis, it is worth noting they supplement direct taxation revenue.

3.2 Indirect Benefit: The Social or Micro-Level Case

In addition to revenue generation, the use of a mobile phone can itself produce follow-on economic and social benefit, e.g., enhance entrepreneurship, reduce information asymmetries and market inefficiencies and substitute transportation (resulting in another knock-on effect).

A recent economic study carried out by World Resources Institute (WRI) and the International Finance Corporation (IFC); (WRI, IFC, 2007) entitled The Next Four Billion, to determine how poor people living in developing countries spent their money found that even very poor families were buying cell phones and airtime, usually in the form of prepaid cards. Another finding was that as their family’s income grew - from $1 per day to $4, for example - their spending on ICT increased faster than spending in any other category, including education, health, and housing.

Due to the intangible nature of some of the benefits, these factors are difficult to monetize. Deloitte (2008) used the consumer’s willingness to pay and ‘consumer surplus’ as proxies to estimate the market value placed on such factors. Additionally, for each benefit, we have supplied an evidence-based case study, which helps to illustrate the impact of mobile phones at the micro level, in reducing poverty: for example, reducing market inefficiencies in Bangladesh or information asymmetries in India.

3.2.1 Entrepreneurship and Job Search

Mobiles reduce the cost of running a business - and may even enable a user to start one. In China, Chipchase (2006) reported on the case of the live-in housekeeper, who was more or less an indentured servant until she got a cell phone, so new customers could call for her services – or the porter who spent his days hanging around outside of construction sites and department stores and hoping to be hired to carry other people's loads, but now can go only where the jobs are. In Pakistan, many women have been able to start small businesses for the provision of beauty and hairdressing services, without the need to incur costs of setting up beauty salons. In Thailand, taxi passengers can share the cost of hiring a cab and the mobile is being used to agree time shares.

Overall, Chipchase and other researchers provided anecdotal evidence to support the theory that the use of a mobile phone is an invaluable enabler of entrepreneurship and job search – not to mention the social benefits on the side. Over several years, his research team has spoken to: day laborers, farmers, prostitutes, rickshaw drivers, shopkeepers and 'all of them say more or less the same thing: their income gets a big boost when they have access to a mobile'. In the case study below, we can also see how even ownership of a mobile phone can itself be leveraged as a form of entrepreneurship: there are many examples of end users using the mobile phone: (a) for m-banking applications; (b) to make payments; and (c) transfer resources to family back home.

3.2.2 Information Asymmetry

The use of mobile phones may reduce information asymmetries, enabling users to access arbitrage, market or trade opportunities that they otherwise would have missed out on. Jensen (2007) in a recent study of fishermen in the Kerala state in India has shown that the use of mobile phones by fishermen in Kerala to arbitrage over price information from potential buyers and coordinate sales has helped them to increase incomes and reduce wastage. Since the use of mobile phones in 1997, there has been noticeable impact on reduction in price variation (mean coefficient of variation declined from 60-70% to 15%), which ensured price stability for the consumer and a nearly perfect spatial arbitrage replaced a collection of autarkic fishing markets.

The survey of 300 sardine fishing units was conducted every Tuesday, from September 3, 1996 to May 29, 2001. Data on: amount of fish caught; costs of operation; sale conditions (market, price, quantity, time, etc.); weather conditions and whether they used a mobile phone were obtained. The survey found that phones were bought by the largest boats first as they could get the largest possible arbitrage gains and could afford the $100 phones. This study concluded that the use of mobile phones: (a) increased consumer surplus (by an average of 6%); (b) increased the fishermen's profits (by an average of 8%); (c) reduced price dispersion (by a decline of 4%) and reduced waste (which was averaging 5-8% of daily catch, before the use of mobile phones).

Another study carried out by Jonas Myhr on 'livelihood changes enabled by mobile phone' in Tanzania demonstrated that increased access to information through the use of mobile phones by fishermen in Tanzania resulted in empowering them through increased bargaining power, knowledge about market opportunities. There were little or no negative effects (Myhr 2006).

3.2.3 Market Inefficiencies

The use of mobile phones can also correct other market inefficiencies or rather supply market efficiencies to redress the balance. For example, affordable access to information is a way of correcting this market inefficiency. The Palliathya help line in Bangladesh[8] is a successful example in this area. Pallitathya uses mobile phones to both increase access to information on the part of men and women living in Bangladesh's rural areas, as well as to stimulate economic opportunities for underprivileged women. The pilot phase offered help-line services to those living in 4 villages of Bagerhat, Jhenaidah, Magura and Nilpahamari districts in Bangladesh using a mobile phone based model.

The helpline services would: (a) prevent exploitation by middlemen; (b) provide employment opportunities (particularly for rural women); (c) reduce information gaps; (d) save cost and time; (e) strengthen access of service providers to rural people. This initiative uses face-to-face contact, together with ICT, to empower women economically, as well as to share community-relevant information on: education, emergency situations, markets, weather, etc. The Palliathya case shows that lack of relevant and timely information was a major bottleneck to rural development. Overall, both these cases demonstrate the importance of the role of information for the functioning of markets and that well-functioning markets have a positive impact on welfare.

3.2.4 Transport Substitution

One interesting side-effect of the use of mobiles is the reduction of transportation costs: household expenditure drops and consumer surplus increases. As our previous two case studies have demonstrated, improvements in the information flows between buyers and sellers allow for the efficient trading of information without the traveling. This is particularly significant in rural areas, where traders would have needed to travel to urban areas to check for demand and negotiate on price, this business is now conducted on the mobile. Traders are able to ensure demand exists for their products, before setting out on a journey. Moreover, in certain circumstances, mobile phones can allow the 'middle man' to be cut out.

Two often-overlapping sub-groups benefit the most here: itinerant workers and rural workers. Itinerant workers were surveyed by the McKinsey study (McKinsey 2007), which surveyed 600 workers in China, who traveled for their jobs (e.g. plumbers, salespeople and taxi drivers). McKinsey found that mobile phones offered itinerant workers time savings of 6% - a productivity gain worth some $33 billion in 2005. Rural workers were surveyed by Samuel, Shah and Hadingham (Samuel 2005), [9] who found that 56% of businesses in South Africa identified reduced travel as a beneficial impact of the mobile phone, as opposed to just 10% of businesses in Egypt. This was attributed to the 'predominance of rural firms in the South African sample'.

Consumer Surplus: McKinsey 2007 then further developed this idea of transportation savings, by arguing that part of the value of these gains went to the operators as service fees, but that the

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[8] The initiative was named winner of 2005 Gender and ICT Awards: http://www.comminit.com/en/node/132155/36

[9] Samuel, Jonathan, Niraj Shah & Wenona Hadingham, Mobile Communications in Egypt, South Africa & Tanzania: Results from Business & Community Surveys, *Vodafone Policy Paper Series No 3* (Mar 2005)

end user held the remainder as their ‘consumer surplus’. The theory of consumer surplus takes the average revenue per user (ARPU) - at the time the mobile phone is purchased - and assumes that it does not change over time, i.e. it is used as fixed proxy for the value the end user places on his/her mobile phone. By subtracting contemporary ARPU figures from historical ARPU figures (because, as subscriber levels increase, ARPU falls), the value ‘returned’ to the end user and presumably re-injected into the economy as a whole, represents a so-called ‘consumer surplus’.

The value of this consumer surplus can be considerable: in 2005, it was $37 billion for China and $4 billion for both India and the Philippines. (These figures are approximate and conservative, because they do not take into account advances in the coverage and quality of the network.)

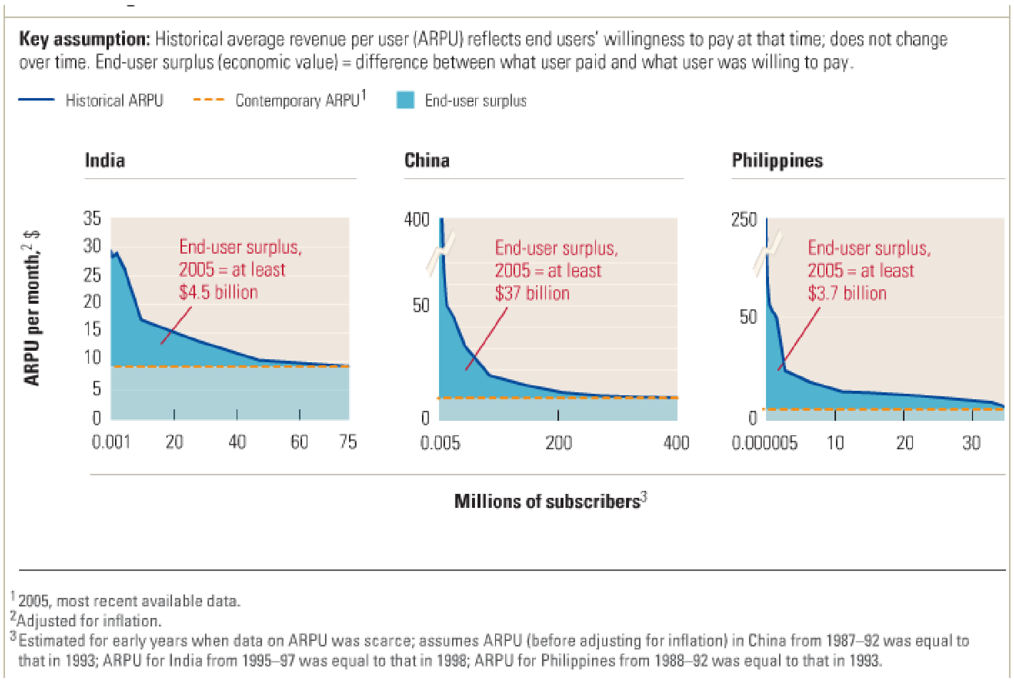

Figure 14: Calculating Consumer Surplus to the End User
Source: McKinsey, The True Value of Mobile Phones to Developing Markets (2007)

3.3 Intangible Benefits

So far, we have discussed four types of indirect benefit of the mobile phones: its value in terms of facilitating entrepreneurship, reducing information asymmetries and market inefficiencies and substituting transportation. In the final section of analysis on the benefits of mobile telephony, we look at purely intangible benefits, which are difficult to value, may not have direct economic benefit, but will certainly enhance and promote the growth of culture, society and societal ties. Here, our analysis includes discussion of the mobile phone as a tool for: (a) aiding disaster relief; (b) enabling the dissemination of locally-generated and locally-relevant educational and health information; and (c) promoting social capital and social cohesion.

3.3.1 Disaster Relief

Chipchase (2006) analyzed the value of the mobile phone as a fixed identity point, which can be immensely valuable to populations that are constantly on the move – displaced by drought, floods, wars or weak economies – in terms of, not just enhancing business opportunities, but also keeping in touch with one's home community, either in an emergency or more everyday basis.

Deloitte (2008) offered a specific example. In 2007, during severe flooding in Indonesia, DiGi was able to identify all its subscribers in Malaysia that were registered as being immigrants from Indonesia and offered them free airtime. Mobile operators have also been active in disaster relief efforts in Pakistan and Thailand, providing emergency-related communications infrastructure.

3.3.2 Education & Health

Mobile services are being used to disseminate locally-generated and locally-relevant educational and health information, in order to target rural communities, whose populations are typically have low levels of education and income and would not otherwise benefit from such information. There is evidence to suggest that this type of benefit could save lives in rural communities.

3.3.3 Social Capital and Social Cohesion

Social capital or social cohesion could be one of the most important forms of intangible benefit – and yet it is also the most ill-defined and slippery. Fukuyama defines it as 'an instantiated informal norm that promotes cooperation between two or more individuals'. Putnam defines it as 'features of social life - networks, norms and trust – that enable participants to act together more effectively to pursue shared objectives. Woolcock refers to 'the information, trust and norms of reciprocity inhering in one's social networks'. Either way, economists are interested in social capital for its contribution to productivity and spillover from the individual to the group: a network effect or social externality, and it is clearly an impact that mobile phones can provide.

Goodman (2005) found that there were links between mobile usage, rural communities and social capital in his study of communities in South Africa and Tanzania. Mobiles facilitated three types of social capital: as an amenity & shared commodity; to mediate strong links (with family and friends and other community members) and to mediate weak links (with individuals 'outside' the community, e.g., businessmen, government officials, tradesmen, etc.)

4 Global Emerging Trends

It is widely acknowledged by industry insiders and outsiders alike that the mobile telephony business is fast-changing and highly responsive to consumer demand – in both the developed and developing worlds. Dynamic chances in technology present telecommunications providers with the challenge of supplying an integrated data, media and voice service at higher speed, yet lower cost (Kaul et al 2008). In this section we examine three prevailing global trends that impact our expectations of mobile telephony take-up and usage in rural communities.

First is the overarching global trend of *converged applications* and *converged devices,* i.e. the idea of a single converged mobile device, which can perform multiple functions. The idea of converged applications and converged devices have so far come hand-in-hand, enabling us to: 'close the gap between the *devices* we use to contact people when we need information and the *applications* and business processes where we use that information' (Gates, 2006). Yet what does this mean for the developed world? Many parts of Africa experienced a surprising boom in uptake, together with creative usage, when expensive fixed line telephony was substituted with less expensive mobile telephony. It may be that rural communities, who previously did not have access to converged functionality (e.g., camera, multimedia, etc.) will similarly find creative ways to apply them.

Second is the evolving *pricing strategies* and *revenue streams*. In the developed world, revenue has migrated from voice to data and IP. Will the developed world follow? In other words, applications and usages are evolving, along with pricing models and revenue streams. Whilst it may be true that rural communities can find innovative ways to apply technology not previously available to them (e.g., Indian fisherman finding out where to land their catch), none of this would be possible without a new pricing model that has re-valued SMS from a mere 10% side player in revenue streams to a main staple. Similarly, if multimedia functions could also be price-dropped from an elitist, overpriced niche product for tech geeks to a commoditized mass market necessity, these functions could drive rural economic and social transformation.

Third is *social mobility* and *virtual communities*, e.g. blogging, user-generated content, and Wikis. These new trends have put content production in the hands of the end user. For rural communities, access could mean real-time access to relevant content, created among the community and by the community to address pressing issues, perhaps initially education and health, but increasingly other social functions. Information could be shared between rural communities within the same country and even globally – decreasingly isolation, flattening the learning curve and removing the need to reinvent the wheel for every type of community initiative: from education, finance, health, microfinance, private sector development, and many other arenas.

5 Conclusion

In conclusion, there is considerable evidence to suggest that the economic and social benefit of mobile telephony will be highest in rural areas, which currently have less telephony services. Both poverty and lack of information are common bed partners. Thus, the dissemination of information together with serving rural areas has double anti-poverty imperative. Studies have attributed multiple benefits to the mobile phone: from lowering negative aspects (e.g., corruption, crime, high prices) to raising positive aspects (e.g., levels of education, efficiency, health). Such benefits already witnessed in the developing world can also spread to the developing world, provided the right level of access and pricing are put into place.

It is clear that the deployment of mobile phones does have a multi-dimensional positive impact on sustainable poverty reduction. Thus, going forward, it remains important to make the mobile phone as cheaply and widely accessible as possible. This involves two important development dimensions: cost and distribution. *Cost* of devices and services have been declining, as developed world markets saturate and mobile operators and service providers increasing compete for a share of the dwindling developing world market. Rural access seems a logical next step in global penetration – and development partners, the government, the private sector, and the World Bank have all acknowledged its importance.

However, in order to achieve the maximum impact, it remains vital to continue the evaluation of the development impact of mobile phones on sustainable poverty reduction to help identify relevant applications and business models, which would maximize the economic and social benefits, whilst minimizing costs, both start-up and ongoing, for the mobile operator, so these are not passed on to the end user. Moreover, whilst it is easier to measure the economic and tangible benefits, a clear, sophisticated methodology for measuring the social and intangible benefits is yet to be developed. Yet, in rural communities, where family, kinship and societal ties are often stronger than in urban communities, these benefits remain the compelling yet untold story.

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